REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS
BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)	5. TYPE OF REPORT & PERIOD COVERED
Phase I Inspection Report New Rochelle Reservoir No. 3 Hutchinson River Basin, Westchester County, NY Inventory No. NY 110	Phase I Inspection Report National Dam Safety Program
	6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)	8. CONTRACT OR GRANT NUMBER(s)
George Koch, P.E.	DACW -51-79-C-0001

9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
New York State Department of Environmental Conservation/ 50 Wolf Road Albany, New York 12233	

11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE
New York State Department of Environmental Conservation/ 50 Wolf Road Albany, New York 12233	4 Sept 1979
	13. NUMBER OF PAGES

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report)
Department of the Army 26 Federal Plaza/ New York District, CofE New York, New York 10007	UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; Distribution unlimited.

National Dam Safety Program.
New Rochelle Reservoir Number 3 Dam,
Hutchinson River Basin, Westchester
County, New York. Phase 1 Inspection
Report.

RECEIVED NOV 1 1979

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability

New Rochelle Reservoir No. 3
Westchester County

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

New Rochelle Reservoir No. 3 did not reveal any conditions which pose an immediate threat to life or property. Additional studies recommended. It has been determined that the embankment would be overtopped for all storms exceeding 35% of the PMF. Significantly dangerous water surface levels could

(over)

DD FORM 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

DDC FILE COPY

AD A075890

20. **(Continued)**

be reached downstream of the dam if the embankment is completely breached. Consequently, the dam is assessed as unsafe, non-emergency (SEE REPORT ASSESSMENT). An emergency operation plan, warning system, and surveillance should be implemented as remedial measures are completed. Minor deficiencies exist.

DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY
PRACTICABLE. THE COPY FURNISHED
TO DDC CONTAINED A SIGNIFICANT
NUMBER OF PAGES WHICH DO NOT
REPRODUCE LEGIBLY.

HUTCHINSON RIVER BASIN

NEW ROCHELLE RESERVOIR NO. 3

WESTCHESTER COUNTY, NEW YORK
INVENTORY NO. N.Y. 110

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

CONTRACT NO. DACW-51-79-C0001

Accession For

NTIS GRA&I	✓
DDC TAB	☐
Unannounced	☐
Justification___	

By___

Distribution/

Availability Codes

| Dist | Avail and/or special |

A 23

NEW YORK DISTRICT CORPS OF ENGINEERS

MARCH, 1979

79 10 31 027

HUTCHINSON RIVER BASIN
NEW ROCHELLE RESERVOIR NO. 3 DAM
I.D. No. N.Y. 110
Phase I Inspection Report

TABLE OF CONTENTS

APPENDIX

Name of Dam: New Rochelle Reservoir No. 3 Dam
                                       I.D. No. NY 110 (#215-1336)

State Located: New York

County: Westchester

Watershed: Hutchinson River Basin

Stream: Hutchinson River

Date of Inspection: November 16, 1978

ASSESSMENT

Examination of available documents and a visual inspection of
the dam did not reveal conditions which constitute an immediate
hazard to human life or property. However, additional studies should
be undertaken to further evaluate conditions affecting the dam.

Additional hydrologic investigations are required to more ac-
curately determine the site specific characteristics of the watershed.
Using the Corps of Engineer's Screening Criteria for initial review
of spillway adequacy, it has been determined that the embankment would
be overtopped for all storms exceeding approximately 35% of the PMF
(Probable Maximum Flood). A flood wave analysis, assuming a complete
breaching of the embankment, indicates that water surface levels down-
stream of the dam could reach levels which would pose significant danger
to residents. The spillway is, therefore, adjudged as seriously inadequate
and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because a ser-
iously inadequate spillway is not meant to connote the same degree of
emergency as would be associated with an "unsafe" classification applied
for a structural deficiency. It does mean that there appears to be a
serious deficiency in spillway capacity and if a severe storm were to
occur, overtopping and failure of the dam could take place, significantly
increasing the hazard to loss of life downstream of the dam.

It is, therefore recommended that within 3 months of the date of
notification of the owners, a hydrologic investigation of the structure
should be undertaken to determine the appropriate mitigating measures to
be taken. Within 18 months of the date of notification, appropriate
remedial measures should be completed. In the interim, a detailed
emergency operation plan and warning system should be developed and

around-the-clock surveillance should be provided during periods of unusually heavy precipitation. In addition, all steplogs should be removed to provide increased spillway capacity.

There are also several minor deficiencies on this structure which should be corrected. The trees and brush on the embankment should be cut and the gully on the downstream face should be filled in. The gunite on the spillway should be patched. Finally, the reservoir drain control rod should be repaired and the drain made operational. These actions should be taken within 6 months of the date of notification of the owner.

George Koch
George Koch
Chief, Dam Safety Section
New York State Department
        of Environmental Conservation
NY License No. 45937

Approved By:

Col. Clark H. Benn
New York District Engineer

Date:

4 Sept 79

OVERVIEW

NEW ROCHELLE RESERVIOR No. 3 (N.Y. 110)

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NEW ROCHELLE RESERVOIR No. 3
I.D. No. NY 110
(#215-1336)
HUTCHINSON RIVER BASIN
WESTCHESTER COUNTY, NEW YORK

SECTION 1:   PROJECT INFORMATION

1.1   GENERAL

        a. Authority
        The Phase 1 Inspection reported herein was authorized by the
        Department of the Army, New York District, Corps of Engineers,
        to fulfill the requirements of the National Dam Inspection Act,
        Public Law 92-367.

        b. Purpose of Inspection
        This inspection was conducted to evaluate the existing conditions
        of the dam, to identify deficiencies and hazardous conditions,
        to determine if these deficiencies constitute hazards to life
        and property, and to recommend remedial measures where required.

1.2   DESCRIPTION OF PROJECT

        a. Description of the Dam and Appurtenant Structures
        The New Rochelle Reservoir No. 3 Dam consists of an earth embank-
        ment with a concrete chute spillway passing through the center
        of the dike.

        The embankment is approximately 30 feet high and 450 feet long.
        The crest is about 6 feet wide. The plans indicate that a core
        wall extends the length of the embankment. The upstream slope
        is 1 vertical on 2 1/2 horizontal. The downstream slope is 1 vertical
        on 2 horizontal.

        The spillway, which is in the center of the embankment, was recon-
        structed in 1949. It now consists of a concrete chute spillway,
        34 feet wide. A three span bridge carrying a bridle path, runs
        along the crest of the dam and crosses the spillway channel. Two
        pointed nosed piers are located in the spillway. There are provisions
        for up to two feet of concrete stoplogs on each of the two outside
        spans.

        Beyond the rounded crest, the spillway chute proceeds down on a 1
        vertical on 1 1/2 horizontal slope to the stream channel. The downstreme slope
        consists of stone paving covered with 3 inches of gunite. The channel,
        which is concrete lined in this area, then passes under a ramp, under
        the Hutchinson River Parkway, and then into the natural stream channel.

1

A 42 inch diameter cast iron drain pipe is shown on the plans. The pipe outlets near the base of the spillway channel. A inclined valve control rod extends from a point on the upstream slope out into the reservoir. This valve rod may be presumed to control a 24 inch valve which is at the inlet to the drain pipe. While the 42 inch pipe has a plug at the inlet end, it is not known whether this could be easily removed. Therefore, the inlet to the drain is controlled by the 24 inch inlet.

b. Location

The New Rochelle Reservoir No. 3 Dam is located on the southern end of the reservoir. The boundary line separating the City of New Rochelle from the Town of Eastchester runs through the dam. Reservoir No. 3 is the middle of the three reservoirs which are within a mile of one another on the Hutchinson River.

c. Size Classification

This dam is 31.5 feet high and the reservoir has a storage capacity of 230 acre feet. Therefore, the dam is in the small size category as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

The dam is classified as "high" hazard due to the presence of the Hutchinson River Parkway immediately downstream of the dam. In addition, there are a number of homes downstream of the dam, and a number of homes beyond the point where the stream passes under the parkway.

e. Ownership

This dam is now owned by Westchester County and under the jurisdiction of the County Department of Parks, Recreation and Conservation. Mr. John Fava (914-682-2616) is the Director of Park Facilities for Westchester County.

f. Purpose of Dam

The dam was originally constructed to provide water to be used by the New Rochelle Water Company. The dam was turned over to the county around 1920 and is now used to maintain the water surface for recreational purposes.

g. Design and Construction History

Based on the records available, the dam was built in 1908 by the New Rochelle Water Company. After Westchester County took over the dam, extensive renovations were made to the spillway in 1949. The changes made were based on plans prepared by the Westchester County Department of Public Works.

. Normal Operating Procedures

Water flows over an ungated spillway. The level of the reservoir may be varied by 2 feet by the addition or removal of concrete stoplogs.

2

1.3   PERTINENT DATA

a. Drainage Area (acres)   1826

b. Discharge at Dam (cfs)

   Total (Spillway with no stoplogs)   1815
     at Maximum High Water
   Spillway with 2 ft. of stoplogs in place   1357
     at Maximum High Water
   Reservoir Drain at Spillway Crest Elevation   37

c. Elevations (Based on USGS Datum)

   Top of dam   130.5
   Spillway Crest   123.0
   Invert Reservoir Drain Inlet   101.8

d. Reservoir (acres)

   Surface Area at top of dam   47.4
   Surface Area at spillway crest   27.5

e. Storage Capacity (acre-feet)

   Top of Dam   498
   Spillway Crest   220

f. Dam

   Embankment Type: Earthfill with corewall
   Embankment Length (ft)   450
   Slopes (V : H) Upstream   1: 2.5
                   Downstream   1:2
   Crest Elevation   130.5
   Crest Width (ft)   6

g. Spillway

   Type: Concrete chute with two piers
                    supporting small bridge crossing
                    spillway in center of channel.
                    Provisions for up to 2 feet of
                    concrete stoplogs under the two
                    outside spans.

   Length: (ft) Weir   34.0

h. Reservoir Drain

   Type: 42 inch diameter cast iron pipe with
                    a 24 inch diameter pipe and valve
                    controlling the inlet.

   Control: Mechanically operated valve with stem
                    extending up to point on upstream slope.

3

SECTION 2: ENGINEERING DATA

2.1   DESIGN

a. Geology

The New Rochelle Reservoir No. 3 Dam is located in the Manhattan Hills section of the New England Uplands physiographic province of New York State. This province consists of low hilly terrain of gentle relief. The bedrock in the area, formed during the Cambrian and Ordovician eras has been intensely metamorphosed, heavily injected and re-crystallized. Shale, slate, schist, gneiss and quartzite are among the types of rock in this area. The surficial soils are the result of glaciations during the Cenozoic Era, the last of which was the Wisconsin glaciation.

b. Subsurface Information

No records from subsurface investigations which may have been made at the time of construction of this dam were available. The only information which was available was from the 1915 New York State Conservation Commission inspection report which states that the dam is founded on rock.

2.2   CONSTRUCTION RECORDS

No construction records were available from the original construction of this structure. However, the spillway was extensively rehabilitated in 1949 and a complete set of the contract plans, prepared by the Westchester County Department of Public Works, were available.

2.3   OPERATING RECORDS

There were no operating or water level records available for this structure.

2.4   EVALUATION OF DATA

The data presented in this report was obtained from the Department of Environmental Conservation files. While only limited data was available concerning the subsurface conditions, overall, the information available appears to be adequate and reliable for the purpose of the Phase 1 inspection.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of the New Rochelle Reservoir No. 3 Dam was conducted on November 16, 1978. The weather was clear and the temperature was around 40° F. Water was flowing over the spillway at a depth of approximately 6 inches at the time of the inspection.

b. Embankment

The embankment was in satisfactory condition. There were no indications of sloughing, subsidence, or movement.

The upstream face was covered with riprap. A number of small trees were growing through the riprap on this face. A bridle path crossed along the crest of the dam and so there was no vegitation on the crest. Light brush and vines were growing on the eastern end of the downstream slope. A small gully up to 2 feet deep running along the edge of the eastern spillway wall has been formed by surface runoff from the crest. About half the area to the west of the spillway was covered with grass. The grass had been mowed and the section was in good condition except for a path which had been worn into the slope. The area on the downstream slope nearest the west abutment was overgrown with large trees and brush. There was a low area beyond the western end of the embankment.

c. Spillway

The spillway was in satisfactory condition. It was reconstructed in 1949 and a bridge for the bridle path was added across the top sometime after 1972. The concrete surfaces were in good condition with the exception of one area on the downstream slope of the spillway channel. A layer of gunite had peeled off of a section which was approximately 10 feet long and 10 feet wide.

There are provisions for stoplogs under two of the three spans of the bridge. At the time of the inspection, three concrete stoplogs (1 foot total) were in place under the western span and 4 logs (1.4 feet) in under the eastern span. All of the logs in place were in good condition.

d. Reservoir Drain

Visual observations of the reservoir drain were limited to inspection of the outlet and the valve control rod on the upstream slope. The drain outlets at the base of the spillway channel. A log was lodged in the semi-circular opening for the drain outlet. The valve control rod was bent and the frame supporting the rod was in need of repair.

e. Downstream Channel

The channel beyond the end of the spillway is lined with concrete for several hundred feet. The channel passes under bridges for a bridle path, a highway ramp, and the Hutchinson River Parkway before re-entering the natural channel. The concrete in the channel was in good condition.

3.2   EVALUATION OF OBSERVATIONS

Visual observations did not reveal any serious problems which would affect the immediate safety of the dam. However, the following deficiencies were noted:

a. Trees and brush growing on dam should be cut.

b. The section on the spillway where the gunite has come off should be repaired before it deteriorates further.

c. The gully adjacent to the eastern wall of the spillway should be filled in and regraded.

d. The reservoir drain control rod should be repaired and the drain made operational.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1   PROCEDURE
The normal water surface elevation is at the crest of the spillway.
The water surface may be varied by the addition or removal of up to
2 feet of concrete stoplogs. The reservoir provides 278 acre-feet
of storage between the crest of the spillway and the top of the dam.

4.2   MAINTENANCE OF DAM
The spillway was reconstructed in 1949. It appears that routine
maintenance such as mowing the grass is performed on this structure
at regular intervals. However, the brush and trees which are growing
on the dam in several locations should be cut.

4.3   WARNING SYSTEM IN EFFECT
No apparent warning system is present.

4.4   EVALUATION
All brush and trees growing on the dam embankment should be cut and
a regular inspection and maintenance program should be implemented
to keep the embankment relatively clear. In addition, the reservoir
drain should be made operational and checked periodically.

SECTION 5: HYDROLOGIC/HYDRAULIC

5.1   DRAINAGE AREA CHARACTERISTICS
Delineation of the contributing watershed to New Rochelle Reservoir
No. 3 was made using the USGS 7.5 minute quadrangle sheet for Mount
Vernon, N.Y. The watershed consists of a heavily developed urban
area and a lightly wooded area, some of which has been developed into
a residential section. Relief ranges from flat to moderate.

New Rochelle Reservoir No. 1 is less than a mile upstream of this
structure, so the drainage area for Reservoir No. 3 encompasses the
drainage area for the upstream reservoir as well. The size of the
rectangularly shaped drainage area for Reservoir No. 3 is 1826 acres,
which includes the 1292 acres which form the watershed for Reservoir
No. 1.

5.2   ANALYSIS CRITERIA
No hydrologic/hydraulic information was available regarding the original
design for this dam. Therefore, the analysis of the spillway capacity
of the dam was performed using the Corps of Engineers HEC-1 (Dam Break Version)
computer program; incorporating the "Snyder Synthetic Unit Hydrograph
Method" and the "Modified Puls" flood routing procedure. The spillway
design flood selected for analysis was the Probable Maximum Flood (PMF)
in accordance with recommended guidelines of the U.S. Army Corps of
Engineers.

The watershed was divided into two areas for the analysis. The first
portion was the 1292 acres which form the watershed for Reservoir No. 1.
The second portion was the remaining 534 acres which are downstream of
Reservoir No. 1. A hydrograph was developed and routed to the Reservoir
No. 3 Dam for each of these areas. The routed hydrographs were then
combined to arrive at the total outflow at this dam. The analysis was
performed assuming that Reservoir No. 1 Dam does not fail even though
the masonry portion of the dam is overtopped.

5.3   SPILLWAY CAPACITY
The chute spillway, located in the center of the embankment, has a crest
4 feet wide and 34 feet long. This length is reduced by two concrete
piers each 1.5 feet wide which support the bridge for the bridle path.
Stoplogs which can be placed across two of the spans and the steel
superstructure for the bridge further reduce the spillway capacity. There
is a drop of 24 feet between the spillway crest and the invert of the
exit channel.

Hydraulically, the spillway was analyzed using a discharge coefficient,
C, of 3.4 for weir flow and 0.6 for orifice flow. Due to the constrictions
in the channel, the spillway length was reduced to 29 feet for the purposes
of the analysis. The computed spillway discharge capacity, without stop-
logs, when the water reaches the top of the dam is 1815 cfs.

The spillway without stoplogs does not have sufficient capacity for the
peak outflow from either the PMF or 1/2 the PMF. For the PMF, the peak
inflow is 5115 cfs and the peak outflow is 5194 cfs. For 1/2 the PMF, the
peak inflow is 2557 cfs and the peak outflow is 2556 cfs.

8

5.4   RESERVOIR CAPACITY
Normal reservoir capacity when the water surface is at the spillway
crest is 220 acre-feet. Surcharge storage capacity to the top of
the dam is an additional 239 acre-feet, which is equivalent to a
runoff depth of 1.6 inches over the drainage area.

5.5   FLOODS OF RECORD
No information was available regarding the occurrence of the maximum
known flood.

5.6   OVERTOPPING POTENTIAL
Analysis using the PMF and 1/2 the PMF indicates that the spillway does
not have sufficient discharge capacity. For a PMF peak outflow of 5194
cfs, the service spillway capacity of 1815 is only 35%. Hence, the
embankment would be overtopped to a computed depth of 1.73 feet for this
outflow.

For the peak outflow from the 1/2 PMF, the embankment would be overtopped
to a computed depth of 0.60 feet.

5.7   EVALUATION
Using the Corps of Engineer's screening criteria for initial review of
spillway adequacy, it has been determined that the embankment would
be overtopped by all storms exceeding approximately 35% of the PMF.
A flood wave analysis, assuming complete breaching of the embankment,
indicates that water surface levels downstream of the dam could reach
levels which would pose a significant danger to residents.

The spillway is, therefore, adjudged as seriously inadequate and the
dam is assessed as unsafe, non-emergency.

SECTION 6: STRUCTURAL STABILITY

6.1   EVALUATION OF STRUCTURAL STABILITY

        a. Visual Observations
        Visual observations of the structure did not reveal any sign of major
        distress.

        b. Design and Construction Data
        No design computations or other data were available concerning the
        structural stability of the dam. The contract plans from the 1949 re-
        construction of the spillway were available and sheets from these plans
        have been included in Appendix F.

        The 1949 plans indicate that the structure has a core wall. This was
        in existence prior to 1949 and it is assumed that this wall was built
        as part of the original construction of the dam in 1908. The 1915
        Conservation Commission reports indicate that the wall is concrete, but
        no additional information concerning the wall was available.

        c. Post Construction Changes
        Major modifications were made to this structure in 1949. These were
        the only post construction changes for which records were available.

        d. Seismic Stabiltiy
        This dam is located in Seismic Zone No. 1. Since the dam appears to
        be stable and the seismic coefficient is small, a seismic stability
        analysis is not warranted.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

The Phase 1 inspection for New Rochelle Reservoir No. 3 revealed that the spillway is seriously inadequate and outflows from either the PMF or 1/2 the PMF would overtop the dam. This overtopping could cause breaching of the dam and the resulting floodwave would significantly increase the hazard to downstream residents. For this reason, the dam has been assessed as unsafe, non-emergency.

The remaining deficiencies on this structure, such as trees and brush growing on the embankment, are not serious enough to pose a hazard.

b. Adequacy of Information

There was a limited amount of information available for the preparation of this report. The data available was adequate with the exception of a lack of detailed descriptions of subsurface and foundation conditions and of information regarding the dimensions and composition of the core wall.

c. Need for Additional Investigations

Since the spillway was rated as seriously inadequate, additional hydrologic investigations are required to more accurately determine the site-specific characteristics of the watershed.

d. Urgency

The additional investigations which are needed should be commenced within 3 months of the date of notification of the owner that the spillway is seriously inadequate. Within 18 months of the date of notification, appropriate remedial mitigating measures should have been completed.

The minor deficiencies outlined in the next section should be corrected within 6 months of the date of notification.

7.2 RECOMMENDED MEASURES

    a. After the hydrological investigation has been completed, mitigating measures for the spillway can be determined.

    b. All trees and brush on both faces of the embankment should be cut.

    c. The section on the spillway where gunite has come off should be patched.

    d. The gully adjacent to the eastern wall of the spillway should be filled in and regraded.

e. The reservoir drain control rod should be repaired and the drain made operational.

f. A detailed emergency operation plan and warning system should be developed. Also, around-the-clock surveillance should be provided during periods of unusually heavy precipitation.

g. Until the remedial mitigating measures rectifying the seriously inadequate status of the spillway have been completed, all stoplogs should be removed to provide increased spillway capacity.

APPENDIX A

PHOTOGRAPHS
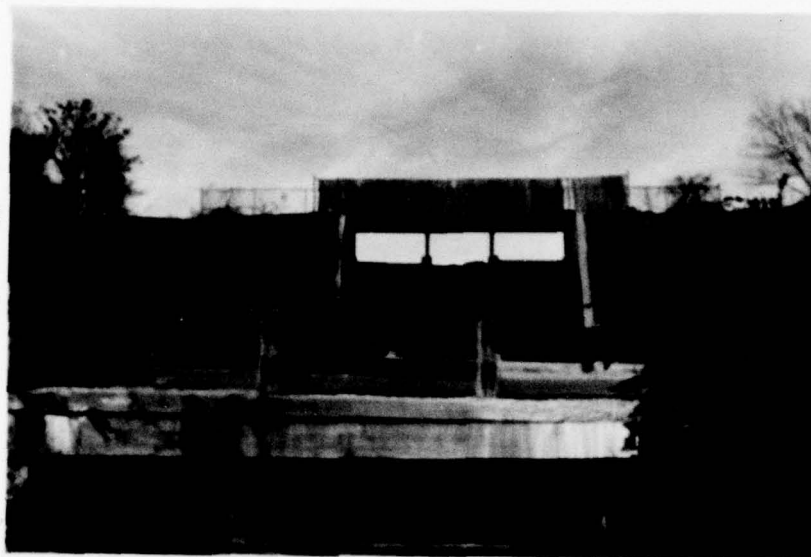
SPILLWAY CHANNEL LOOKING UPSTREAM
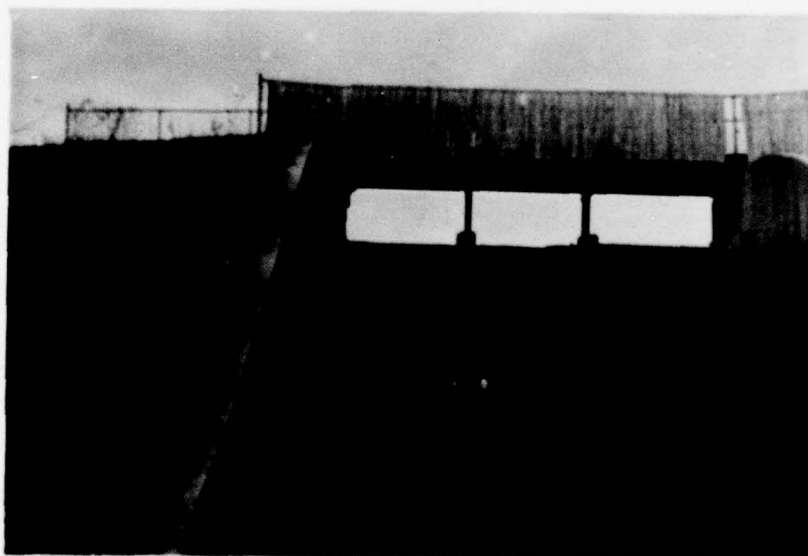
DOWNSTREAM SLOPE OF SPILLWAY CHANNEL
SHOWING SECTION WHERE LAYER OF GUNITE IS MISSING

UPSTREAM SLOPE OF DAM WITH VALVE CONTROL
ROD EXTENDING INTO RESERVOIR

SPILLWAY CREST WITH CONCRETE STOP LOGS IN PLACE

APPENDIX B

ENGINEERING DATA CHECKLIST

Check List
Engineering Data
Design Construction Operation

Item	Plans	Details	Typical Sections
		Remarks	
Dam	None		
Spillway(s)	1949 Reconstruction Plans		
Outlet(s)	" "		
Design Reports	None ⟶		
Design Computations			
Discharge Rating Curves			
Dam Stability			
Seepage Studies			
Subsurface and Materials Investigations			

Item	Remarks
Construction History	NONE
Surveys, Modifications, Post-Construction Engineering Studies and Reports	1949 RECONSTRUCTION PLANS
Accidents or Failure of Dam Description, Reports	NONE
Operation and Maintenance Records Operation Manual	NONE

APPENDIX C

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) Basic Data

   a. General

   Name of Dam NEW ROCHELLE RES. No. 3

   I.D. # N.Y. 110   (215-1336 LONG ISLAND)

   Location: Town EASTCHESTER   County WESTCHESTER

   Stream Name HUTCHINSON RIVER

   Tributary of _____

   Longitude (W), Latitude (N) 73° 48.1'   40° 56.7'

   Hazard Category C

   Date(s) of Inspection 11/16/78

   Weather Conditions 40° PARTLY SUNNY

   b. Inspection Personnel R. WARRENDER   W. LYNICK

   _____

   c. Persons Contacted JOHN FAVA, DIRECTOR OF PARKS WESTCHESTER Co.
      914-682-2616

   d. History:

   Date Constructed 1892 RECONSTRUCTED 1949

   Owner WESTCHESTER Co.

   Designer WESTCHESTER Co. DPW

   Constructed by _____

2) Technical Data

   Type of Dam EARTH WITH CONCRETE CHUTE OGEE SPILLWAY

   Drainage Area 1826 ACRES

   Height 31.5'   Length 450'

   Upstream Slope 1 ON 2½ Downstream Slope 1 ON 2

2) <u>Technical Data</u> (Cont'd.)

External Drains: on Downstream Face _____   @ Downstream Toe _____

Internal Components:

      'Impervious Core ____ CORE WALL _____

      Drains _____

      Cutoff Type _____

      Grout Curtain _____

3) Embankment

a. Crest

(1) Vertical Alignment   SATISFACTORY

(2) Horizontal Alignment   SATISFACTORY

(3) Surface Cracks   NONE

(4) Miscellaneous   BRIDLE PATH CROSSES ⌄ALONG CREST

b. Slopes

(1) Undesirable Growth or Debris, Animal Burrows   TREES ON UPSTREAM SLOPE
BRUSH & VINES ON BOTH SLOPES - SMALL ANIMAL BURROW HOLES 5' ABOVE TOE
20-30' EAST OF EAST SPILLWAY WALL

(2) Sloughing, Subsidence or Depressions   ERODED WALKING PATH
1' DEEP & 3' WIDE FROM CREST DOWN TO W.S.

(3) Slope Protection   ~~None~~ STONE BLOCK - COVERS MOST OF
UPSTREAM FACE

(4) Surface Cracks or Movement at Toe   NONE

(5) Seepage   NONE

(6) Condition Around Outlet Structure   N/A

c. Abutments

_____

_____

(1) Erosion at Embankment and Abutment Contact EAST SIDE OF CHANNEL
MATERIAL DOWN 0-3' BELOW TOP OF EAST WALL

(2) Seepage along Contact of Embankment and Abutment NONE

_____

_____

_____

(3) Seepage at toe or along downstream face NONE

_____

d. Downstream Area - below embankment

UNDERPASS WITH STREAM OUTLET - FLOWS UNDER HUTCH. RIVER
PARKWAY

(1) Subsidence, Depressions, etc. NONE

_____

_____

(2) Seepage, unusual growth NONE

_____

_____

(3) Evidence of surface movement beyond embankment toe NONE

_____

(4) Miscellaneous _____

_____

_____

e. Drainage System

_____

_____

(1) Condition of relief wells, drains, etc. _____

_____

_____

_____

_____

(2) Discharge from Drainage System _____

_____

_____

4) Instrumentation

    (1) Monumentation/Surveys _____

    _____

    _____

    (2) Observation Wells _____

    _____

    _____

    (3) Weirs _____

    _____

    _____

    _____

    (4) Piezometers _____

    _____

    _____

    _____

    _____

    _____

    _____

    (5) Other _____

    _____

5) Reservoir

    a. Slopes _OKAY_____

    _____

    b. Sedimentation _NO PROBLEMS EVIDENT_____

    _____

6) Spillway(s) (including tail race channel)

_____

_____

a. General _____

_____

_____

b. Principle Spillway CONCRETE & GUNITE OGEE CHUTE
GOOD CONDITION EXCEPT FOR ONE AREA 10'x10' WHERE
A LAYER OF GUNITE HAD COME OFF.

_____

_____

c. Emergency or Auxiliary Spillway NONE _____

_____

_____

_____

d. Condition of Tail race channel CONCRETE FLUME - SATISFACTORY

_____

_____

_____

e. Stability of Channel side/slopes SATISFACTORY _____

_____

_____

_____

7) Downstream Channel

     CONCRETE FLUME UNDER RAMP ROAD & HUTCHINSON
     PARKWAY

    a. Condition (debris, etc.) 6" LOG IN CONCRETE CHANNEL

    b. Slopes VERTICAL

    c. Approximate number of homes

8) Miscellaneous

9) Structural

   a. Concrete Surfaces <u>GOOD EXCEPT FOR 10'x10' AREA WHERE A LAYER OF GUNITE HAD COME OFF.</u>

   b. Structural Cracking <u>NONE</u>

   c. Movement - Horizontal & Vertical Alignment (Settlement) <u>NONE</u>

   d. Junctions with Abutments or Embankments <u>SATISFACTORY</u>

   e. Drains - Foundation, Joint, Face <u>SMALL DRAINAGE PIPES PASS THROUGH THE CONCRETE WALLS OF THE CHANNEL. THESE ARE PROBABLY FOR HIGHWAY DRAINAGE.</u>

   f. Water passages, conduits, sluices _____

   g. Seepage or Leakage <u>NONE</u>

h. Joints - Construction, etc. __Good_____

_____

_____

_____

i. Foundation _____

_____

_____

_____

j. Abutments _____

_____

k. Control Gates _____

_____

_____

l. Approach & Outlet Channels __HEAVY BLOCKS - PLACED WELL UP__

__TO CONCRETE ABUTMENT AT SPILLWAY_____

_____

_____

m. Energy Dissipators (plunge pool, etc.) _____

_____

_____

n. Intake Structures _____

_____

_____

_____

o. Stability _____

_____

p. Miscellaneous _____

_____

_____

APPENDIX D

HYDROLOGIC/HYDRAULIC

ENGINEERING DATA AND COMPUTATIONS

AREA-CAPACITY DATA:

	Elevation (ft.) USGS Datum	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	130.5	47.4	498
2) Design High Water (Max. Design Pool)	N/A		
3) Auxiliary Spillway Crest	N/A		
4) Pool Level with Flashboards	N/A		
5) Service Spillway Crest	123.0	27.6	220

DISCHARGES

	Volume (cfs)
1) Average Daily	N/A
2) Spillway @ Maximum High Water	1.814.8
3) Spillway @ Design High Water	
4) Spillway @ Auxiliary Spillway Crest Elevation	
5) Low Level Outlet	~~43.7~~ 37.3
6) Total (of all facilities) @ Maximum High Water	1814.8
7) Maximum Known Flood	N/A

2

CREST:

USGS Datum
ELEVATION: ___130.5___

Type: _LEVEL GRASSED EARTH_____

Width: ___6_____ Length: _450_____

Spillover _SPILLWAY CHANNEL_____

Location _CENTER OF EMBANKMENT_____

SPILLWAY:

PRINCIPAL		EMERGENCY
123.0	Elevation	
CONCRETE ~~OGEE~~ CHUTE	Type	
	Width	

Type of Control

✓	Uncontrolled	

Controlled:

PROVISIONS FOR STOP LOGS ON PORTION OF SPILLWAY	Type (Flashboards; gate)	
	Number	
	Size/Length	
	Invert Material	
	Anticipated Length of operating service	
70'	Chute Length	
0	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	

OUTLET STRUCTURES/EMERGENCY DRAWDOWN FACILITIES:

Type: Gate   √   Sluice _____   Conduit _____   Penstock _____

Shape : CONTROL ROD COMES TO UPSTREAM SLOPE

Size: 24" GATE

Elevations: Entrance Invert 102

Exit Invert 100

Tailrace Channel: Elevation 100

HYDROMETEROLOGICAL GAGES:

Type : N/A

Location:

Records:

Date -

Max. Reading -

FLOOD WATER CONTROL SYSTEM:

Warning System: NONE

Method of Controlled Releases (mechanisms):

PIPE WITH 24" GATE

DRAINAGE AREA: 1826 ACRES

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: URBAN & HEAVILY DEVELOPED

Terrain - Relief: FLAT TO MODERATE

Surface - Soil: SAND- SILT

Runoff Potential (existing or planned extensive alterations to existing
(surface or subsurface conditions)

MODERATE TO HIGH

Potential Sedimentation problem areas (natural or man-made; present or future)

NONE OBVIOUS

Potential Backwater problem areas for levels at maximum storage capacity
including surcharge storage:

POSSIBLE FLOODING OF PARKWAY

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the
Reservoir perimeter:

Location: NONE

Elevation: _____

Reservoir:

Length @ Maximum Pool   .5   (Miles)

Length of Shoreline (@ Spillway Crest)_____ (Miles)

JOB New Rochelle Reservoir No. 3	SHEET NO. 1	CHECKED BY	DATE
SUBJECT Hydrologic / Hydraulic Computations		COMPUTED BY RLW	DATE 3/20/79

Drainage Area = 1826 Acres = 2.85 Sq. mi.

Lake Surface Area = 27.55 Acres

Elevation: USGS (1956) = 123

Snyder Synthetic Unit Hydrograph:

$L = 3.60$ miles $L_{CA} = 1.59$ miles

$C_t \Rightarrow$ Use 2.0

$t_p = C_t (L \cdot L_{CA})^{.3} = 3.37$ hours

$t_r = \dfrac{t_p}{5.5} = .61$ hours   (Use $\frac{1}{2}$ hr. hydrograph = t_R)

$t_{PR} = t_p + .25(t_R - t_r) = 3.34$ hours

HR #33 PMP Rainfall

Zone 1 near Zone 6   PMP Rain = 22" (200 mi² - 24 hr)

6 HR 112%   24 HR 133%

12 HR 123%   48 HR 142%

TRSPC: $T.F. = 1 - \dfrac{30.08}{(2.85)^{.7718}} = .750$

Loss Data: Initial = 1.0"

          Continuous = .1"

% of D.A. Impervious = 7%

Base Flow = 2 cfs / sq mile $2 \times 2.85 = 4$ cfs

PROJECT GRID

JOB New Rochelle Reservoir No. 3	SHEET NO. 2	CHECKED BY	DATE
SUBJECT Hydrology / Hydraulic Computations		COMPUTED BY RLW	DATE 3/20/79

Conic Method - Generation of Values:

Normal Reservoir Level (USGS Sheet)   123.0 Elev

SURFACE AREA   27.55 Acres

$$Volume = \frac{h(A)}{3} = \frac{(31.5)(27.55)}{3} = 289.3 \text{ Acre-Ft}$$

Apex of Cone: Elev 99.0

Conic Method (Area - Volume) $A = \pi R^2$ $Vol = \frac{\pi}{3} R^2 h$

Elev. (U.S.G.S Datum)	Radius	Area (Acres)	h	Vol (Ac-Ft)
130.5	811.13 ft	47.45	31.5	498
123.0	618 ft	27.55	24	220

JOB New Rochelle Reservoir No.3	SHEET NO. 3	CHECKED BY	DATE
SUBJECT Hydrology / Hydraulic Computations		COMPUTED BY RLW	DATE 3/21/79

Capacity With No Stop Logs In Place

Assume $H_e = 2.1'$ And $P = 1'$

Using Fig 249 $P/H_o = .476$ $\therefore C_o = 3.79$

$L = L' - 2(NK_p + K_a)H_o$

$K_p = 0.0$ For Pointed Nose Piers

$K_A = .10$ Rounded Abut.

Assuming Concrete Pier Continuous To Bridge Beam

$L = (10.3 + 9 + 10.3) - 2[2(0.0) + .10]H_e$

$= 29.6 - .2 H_e$

	Elevation (USGS)	H	L	H_o/H_o	C/C_o	C	Q
Spillway Crest	123.0	0	29.6	0	—	—	0
Top of Stop Logs	125.1	2.1	29.18	1	1.0	3.79	336.5
Bottom of Beam	129.4	6.4	28.4	.34	.89	3.37	1549.6

$Q = C L H^{3/2}$

PROJECT GRID

JOB		SHEET NO.	CHECKED BY	DATE
NEW ROCHELLE RESERVOIR No. 3		4		
SUBJECT			COMPUTED BY	DATE
HYDROLOGY / HYDRAULIC COMPUTATIONS			RLW	4/4/-a

CAPACITY OF SPILLWAY WITH STOP LOGS IN PLACE

WATER LEVEL AT BOTTOM OF BEAM - ELEV. 129.4

BREAK SPILLWAY INTO SECTIONS

1. CENTER SECTION - LOWER

9'

2.1'

$Q = c L H^{3/2}$

$L = L' - 2(N k_p + k_a) H_o$

$\quad = 9 - 2(0 + 0) 6$

$\quad = 9$

$Q = 3.4 (9)(6.1)^{3/2} = 461 \text{ cfs}$

2. CENTER SECTION - UPPER

10.2

4.9'

$L = 10.2 - 2(0 + .2) 4.4$

$\quad = 8.4$

$Q = 3.4 (8.4)(4.4)^{1.5} = 263.6 \text{ cfs}$

3. & 4. TWO OUTSIDE SECTIONS - UPPER

11.3'

4.3

$L = 11.3 - 2(0 + .1)(4.3)$

$\quad = 10.44'$

$Q = 3.4 (10.44)(4.3)^{3/2} = (326.3)(2) = 633.0 \text{ cfs}$

TOTAL CAPACITY $Q = 461 + 263.6 + 633.0 = 1357.6 \text{ cfs}$

PROJECT GRID

JOB		SHEET NO.	CHECKED BY	DATE
NEW ROCHELLE RESERVOIR No. 3		5		
SUBJECT			COMPUTED BY	DATE
HYDROLOGY/HYDRAULIC COMPUTATIONS			RLW	4/4/79

CAPACITY OF SPILLWAY WITH NO STOP LOGS IN PLACE

WATER LEVEL AT TOP OF DAM - ELEV. 130.5

SUBMERGED ORIFICE

$$Q = C a \sqrt{2gh} \qquad = (.6)(181.76)\sqrt{2(32.2)(4.3)} = 1814.8 \, cfs$$

$a = 181.76 \qquad g = 32.2$

$c = .60 \qquad h = 4.3$

DRAIN CAPACITY - WATER AT SPILLWAY CREST

$$q = A \sqrt{\frac{2gH}{1+K_e+K_b+K_L+K_B}} = 3.14 \sqrt{\frac{2(32.2)(22.2)}{1+.2+0+.0459(193)+.05}} = 37.34 \, cfs$$

$A = \pi (1\text{ft})^2 = 3.14 \, ft^2$

$g = 32.2$

$H = 22.2$

$K_e = .2 \qquad K_p = .0459$

$K_b = 0 \qquad L = 193$

$K_B = .05$

PROJECT GRID

JOB		SHEET NO.	CHECKED BY	DATE
NEW ROCHELLE RESERVOIR No. 3		6		
SUBJECT			COMPUTED BY	DATE
HYDROLOGY / HYDRAULIC COMPUTATIONS			RLW	6/29/79

INFORMATION OBTAINED FROM CORPS OF ENGINEER'S

HUTCHINSON RIVER BASIN STUDY

STORAGE DATA - FROM TOPOGRAPHIC MAP PREPARED BY

HARRIS - TOURS ASSOCIATES

ELEVATION	SURFACE AREA (ACRES)	STORAGE (ACRE-FT)
123	25.1	0
124	26.9	26.0
125	28.7	53.8
126	30.6	83.4
127	32.4	114.9
128	34.2	148.2
129.2	36.4	190.6
130	37.9	220.3
131	39.7	259.1

THESE VALUES ASSUME ZERO STORAGE BELOW SPILLWAY

CREST. ACTUAL STORAGE BELOW THIS POINT IS

ABOUT 220 ACRE-FT. (BASED ON OUR ESTIMATE).

```
 1    A NEW RUCHELLE RESERVOIR NO 3
 2    A2 PMF WITH RATIOS NO BREACH 3
 3    A DATE
 4    B    150    0    0    0    0    0    0
 5    B1     5
 6    J      1    1    2
 7    J1    .5    1
 8    K      0    1
 9    K1
10    M      1    1  2.02  2.02
11    P      0   22  112  123  133    0
12    T
13    M   3.34   .6  112  123  133  142   INFLOW HYDROGRAPH
14    X      3    3    1
15    K      0    2
16    K1 INFLOW HYDROGRAPH 2
17    M      1    1   .03
18    P      0   22  112  123  133  142
19    T
20    M   1.94  .52
21    X      3    3    1
22    K      2
23    K1 COMBINE HYDROGRAPHS
24    K      1    2
25    K1 COMBINE HYDROGRAPH AT DAM 3 - NO BREACH
```

4A 123 125.1 129.4 130.5 32.4 34.2 36.4 37.9 39.7
Y5 0 336 1550 1815
8A 25.1 26.9 28.7 30.6
8E 123 124 125 126 127 128 129.2 130 131
8S 123
8D 130.5 3.087 1.5 421
K 99

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION    JULY 1978
LAST MODIFICATION   26 FEB 79
MODIFIED FOR HONEYWELL APR 79
**********

**********
THIS PROGRAM IS CURRENTLY BEING MODIFIED
TO RUN ON THE DGS HONEYWELL SYSTEM

PLEASE REPORT ANY UNUSUAL OPERATING PROBLEMS
TO MIKE TILLSON (RM. 423) PH: 7-5666
**********

RUN DATE 06/28/79     NEW ROCHELLE RESERVOIR NO 3
                      PMF WITH RATIOS NO BREACH 3
                      DATE 6/28/79
```

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	1	0	0	0	0	0	0	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1

RTIUS= 0.50 1.00

```
**********          **********          **********
```

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTACE	IAUTO
1	0	0	0	-	0	0	0	0

HYDROGRAPH DATA

IHYDG	IUMG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	2.02	0.	2.02	0.	0.	0	1	1

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.	22.00	112.00	123.00	133.00	142.00	0.	0.

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LRDPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.	0.	1.00	0.	0.	1.00	1.00	0.10	0.	0.

UNIT HYDROGRAPH DATA
TP= 3.34   CP=0.60   NTA= 0

RECESSION DATA
STRTQ= 3.00   QRCSN= 3.00   RTIOR= 1.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 3.88 AND R= 3.28 INTERVALS

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	1.00	1	0.01	0.	0.01	3.
1.01	2.00	2	0.01	0.	0.01	3.
1.01	3.00	3	0.01	0.	0.01	3.
1.01	4.00	4	0.01	0.	0.01	3.
1.01	5.00	5	0.01	0.	0.01	3.
1.01	6.00	6	0.02	0.	0.01	3.
1.01	7.00	7	0.02	0.	0.02	3.
1.01	8.00	8	0.02	0.	0.02	3.
1.01	9.00	9	0.02	0.	0.02	3.
1.01	10.00	10	0.02	0.	0.02	3.
1.01	11.00	11	0.13	0.	0.13	3.
1.01	12.00	12	0.16	0.	0.16	3.
1.01	13.00	13	0.20	0.	0.20	3.
1.01	14.00	14	0.51	0.16	0.36	3.
1.01	15.00	15	0.19	0.09	0.10	3.
1.01	16.00	16	0.15	0.05	0.10	8.
1.01	17.00	17	0.01	0.	0.01	22.
1.01	18.00	18	0.01	0.	0.01	43.
1.01	19.00	19	0.01	0.	0.01	58.
1.01	20.00	20	0.01	0.	0.01	60.
1.01	21.00	21	0.01	0.	0.01	51.
1.01	22.00	22	0.	0.	0.	39.
1.01	23.00	23	0.	0.	0.	30.
1.02	0.	24	0.	0.	0.	23.
1.02	1.00	25	0.12	0.02	0.10	18.
1.02	2.00	26	0.12	0.02	0.10	16.
1.02	3.00	27	0.12	0.02	0.10	17.
1.02	4.00	28	0.12	0.02	0.10	19.
1.02	5.00	29	0.12	0.02	0.10	20.
1.02	6.00	30	0.32	0.22	0.10	22.
1.02	7.00	31	0.32	0.22	0.10	29.
1.02	8.00	32	0.32	0.22	0.10	53.
1.02	9.00	33	0.32	0.22	0.10	95.
1.02	10.00	34	0.32	0.22	0.10	142.
1.02	11.00	35	0.32	0.22	0.10	182.
1.02	12.00	36	1.97	1.87	0.10	211.
1.02	13.00	37	2.37	2.27	0.10	285.
1.02	14.00	38	2.96	2.86	0.10	501.
1.02	15.00	39	7.49	7.39	0.10	902.
1.02	16.00	40	2.76	2.66	0.10	1575.
1.02	17.00	41	2.17	2.07	0.10	2472.
1.02	18.00	42	0.18	0.08	0.10	3262.
1.02	19.00	43	0.18	0.08	0.10	3576.
1.02	20.00	44	0.18	0.08	0.10	3290.
1.02	21.00	45	0.18	0.08	0.10	2678.
1.02	22.00	46	0.18	0.08	0.10	2049.
1.02	23.00	47	0.18	0.08	0.10	1534.
1.02	0.	48	0.18	0.08	0.10	1155.
1.03	0.	49	0.	0.	0.	874.
1.03	2.00	50	0.	0.	0.	660.
1.03	3.00	51	0.	0.	0.	494.
1.03	4.00	52	0.	0.	0.	366.
1.03	5.00	53	0.	0.	0.	270.
1.03	6.00	54	0.	0.	0.	199.
1.03	7.00	55	0.	0.	0.	147.
1.03	8.00	56	0.	0.	0.	108.
1.03	9.00	57	0.	0.	0.	78.
1.03	10.00	58	0.	0.	0.	55.
1.03	11.00	59	0.	0.	0.	37.
1.03	12.00	60	0.	0.	0.	18.

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.04	4.00	76	0.	0.	0.	3.
1.04	5.00	77	0.	0.	0.	3.
1.04	6.00	78	0.	0.	0.	3.
1.04	7.00	79	0.	0.	0.	3.
1.04	8.00	80	0.	0.	0.	3.
1.04	9.00	81	0.	0.	0.	3.
1.04	10.00	82	0.	0.	0.	3.
1.04	11.00	83	0.	0.	0.	3.
1.04	12.00	84	0.	0.	0.	3.
1.04	13.00	85	0.	0.	0.	3.
1.04	14.00	86	0.	0.	0.	3.
1.04	15.00	87	0.	0.	0.	3.
1.04	16.00	88	0.	0.	0.	3.
1.04	17.00	89	0.	0.	0.	3.
1.04	18.00	90	0.	0.	0.	3.
1.04	19.00	91	0.	0.	0.	3.
1.04	20.00	92	0.	0.	0.	3.
1.04	21.00	93	0.	0.	0.	3.
1.04	22.00	94	0.	0.	0.	3.
1.04	23.00	95	0.	0.	0.	3.
1.05	0.	96	0.	0.	0.	3.
1.05	1.00	97	0.	0.	0.	3.
1.05	2.00	98	0.	0.	0.	3.
1.05	3.00	99	0.	0.	0.	3.
1.05	4.00	100	0.	0.	0.	3.
1.05	5.00	101	0.	0.	0.	3.
1.05	6.00	102	0.	0.	0.	3.
1.05	7.00	103	0.	0.	0.	3.
1.05	8.00	104	0.	0.	0.	3.
1.05	9.00	105	0.	0.	0.	3.
1.05	10.00	106	0.	0.	0.	3.
1.05	11.00	107	0.	0.	0.	3.
1.05	12.00	108	0.	0.	0.	3.
1.05	13.00	109	0.	0.	0.	3.
1.05	14.00	110	0.	0.	0.	3.
1.05	15.00	111	0.	0.	0.	3.
1.05	16.00	112	0.	0.	0.	3.
1.05	17.00	113	0.	0.	0.	3.
1.05	18.00	114	0.	0.	0.	3.
1.05	19.00	115	0.	0.	0.	3.
1.05	20.00	116	0.	0.	0.	3.
1.05	21.00	117	0.	0.	0.	3.
1.05	22.00	118	0.	0.	0.	3.
1.05	23.00	119	0.	0.	0.	3.
1.06	0.	120	0.	0.	0.	3.
1.06	1.00	121	0.	0.	0.	3.
1.06	2.00	122	0.	0.	0.	3.
1.06	3.00	123	0.	0.	0.	3.
1.06	4.00	124	0.	0.	0.	3.
1.06	5.00	125	0.	0.	0.	3.
1.06	6.00	126	0.	0.	0.	3.
1.06	7.00	127	0.	0.	0.	3.
1.06	8.00	128	0.	0.	0.	3.
1.06	9.00	129	0.	0.	0.	3.
1.06	10.00	130	0.	0.	0.	3.
1.06	11.00	131	0.	0.	0.	3.
1.06	12.00	132	0.	0.	0.	3.
1.06	13.00	133	0.	0.	0.	3.
1.06	14.00	134	0.	0.	0.	3.
1.06	15.00	135	0.	0.	0.	3.

SUM 24.99 21.29   3.71   28070.
    (635.)(541.)(94.)(794.85)

HYDROGRAPH AT STA   1 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3576.	2048.	1126.	387.	28066.
CMS	101.	81.	32.	11.	795.
INCHES		13.12	20.76	21.36	21.54
MM		333.17	526.70	542.63	547.16
AC-FT		1412.	2233.	2300.	2319.
THOUS CU M		1742.	2754.	2837.	2861.

HYDROGRAPH AT STA   1 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1788.	1624.	563.	193.	14033.
CMS	51.	40.	16.	5.	397.
INCHES		6.56	10.37	10.68	10.77
MM		166.58	263.35	271.32	273.57
AC-FT		706.	1116.	1150.	1160.
THOUS CU M		871.	1377.	1419.	1431.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3576.	2848.	1126.	387.	28066.
CMS	101.	81.	32.	11.	795.
INCHES		13.12	20.74	21.36	21.54
MM		333.17	526.70	542.63	547.16
AC-FT		1412.	2233.	2300.	2319.
THOUS CU M		1742.	2754.	2837.	2861.

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH 2

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	0.83	0.	0.83	0.	0.	1	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.	22.00	112.00	123.00	133.00	142.00	0.	

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.	0.	1.00	0.	0.	1.00	1.00	0.10	0.	0.

UNIT HYDROGRAPH DATA

TP= 1.94   CP=0.52   NTA= 0

RECESSION DATA

STRTQ= 3.00   QRCSN= 3.00   RTIOR= 1.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 2.17 AND R= 2.23 INTERVALS

TP= 1.95 HOURS, CP= 0.52   VOL= 1.00

UNIT HYDROGRAPH 13 END-OF-PERIOD ORDINATES, LAG=

43.   122.   132.   87.   55.   35.   22.   16.   9.   6.

4.   2.   1.

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	1.00	1	0.01	0.	0.01	3.
1.01	2.00	2	0.01	0.	0.01	3.
1.01	3.00	3	0.01	0.	0.01	3.
1.01	4.00	4	0.01	0.	0.01	3.
1.01	5.00	5	0.01	0.	0.01	3.
1.01	6.00	6	0.01	0.	0.01	3.
1.01	7.00	7	0.02	0.	0.02	3.
1.01	8.00	8	0.02	0.	0.02	3.
1.01	9.00	9	0.02	0.	0.02	3.
1.01	10.00	10	0.02	0.	0.02	3.
1.01	11.00	11	0.02	0.	0.02	3.
1.01	12.00	12	0.02	0.	0.02	3.
1.01	13.00	13	0.13	0.	0.13	3.
1.01	14.00	14	0.16	0.	0.16	3.
1.01	15.00	15	0.51	0.16	0.20	3.
1.01	16.00	16	0.26	0.16	0.26	

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.04	4.00	76	0.	0.	0.	3.
1.04	5.00	77	0.	0.	0.	3.
1.04	6.00	78	0.	0.	0.	3.
1.04	7.00	79	0.	0.	0.	3.
1.04	8.00	80	0.	0.	0.	3.
1.04	9.00	81	0.	0.	0.	3.
1.04	10.00	82	0.	0.	0.	3.
1.04	11.00	83	0.	0.	0.	3.
1.04	12.00	84	0.	0.	0.	3.
1.04	13.00	85	0.	0.	0.	3.
1.04	14.00	86	0.	0.	0.	3.
1.04	15.00	87	0.	0.	0.	3.
1.04	16.00	88	0.	0.	0.	3.
1.04	17.00	89	0.	0.	0.	3.
1.04	18.00	90	0.	0.	0.	3.

```
18   1.00   1.01   0        0.01   0        1.01   18   0.02   0        0.00   1.04   1.05   ..   0        0.   0        ..
19   19.00  1.01   0.01     0.01   0.       1.01                                               
20   20.00  1.01   0.01     0.01   0.       1.01
21   21.00  1.01   0.01     0.01   0.       1.01
22   22.00  1.01   0.01     0.01   0.       1.01
23   23.00  1.01   0.01     0.01   0.       1.01
24   0.     1.02   0.12     0.     0.       1.02
25   1.00   1.02   0.12     0.     0.02     1.02
26   2.00   1.02   0.12     0.     0.02     1.02
27   3.00   1.02   0.12     0.     0.02     1.02
28   4.00   1.02   0.12     0.     0.02     1.02
29   5.00   1.02   0.12     0.     0.02     1.02
30   6.00   1.02   0.10     0.     0.02     1.02
31   7.00   1.02   0.32     0.     0.22     1.02
32   8.00   1.02   0.32     0.     0.22     1.02
33   9.00   1.02   0.32     0.     0.22     1.02
34  10.00   1.02   0.32     0.     0.22     1.02
35  11.00   1.02   0.32     0.     0.22     1.02
36  12.00   1.02   0.32     0.     0.22     1.02
37  13.00   1.02   1.97     0.10   1.87     1.02
38  14.00   1.02   2.37     0.10   2.27     1.02
39  15.00   1.02   2.96     0.10   2.86     1.02
40  16.00   1.02   7.49     0.10   7.39     1.02
41  17.00   1.02   2.76     0.10   2.66     1.02
42  18.00   1.02   2.17     0.10   2.07     1.02
43  19.00   1.02   0.18     0.10   0.08     1.02
44  20.00   1.02   0.18     0.10   0.08     1.02
45  21.00   1.02   0.18     0.10   0.08     1.02
46  22.00   1.02   0.18     0.10   0.08     1.02
47  23.00   1.02   0.18     0.10   0.08     1.02
48   0.     1.02   0.18     0.10   0.08     1.02
49   1.00   1.03   0        0.     0.       1.03
50   2.00   1.03   0        0.     0.       1.03
51   3.00   1.03   0        0.     0.       1.03
52   4.00   1.03   0        0.     0.       1.03
53   5.00   1.03   0        0.     0.       1.03
54   6.00   1.03   0        0.     0.       1.03
55   7.00   1.03   0        0.     0.       1.03
56   8.00   1.03   0        0.     0.       1.03
57   9.00   1.03   0        0.     0.       1.03
58  10.00   1.03   0        0.     0.       1.03
59  11.00   1.03   0        0.     0.       1.03
60  12.00   1.03   0        0.     0.       1.03
61  13.00   1.03   0        0.     0.       1.03
62  14.00   1.03   0        0.     0.       1.03
63  15.00   1.03   0        0.     0.       1.03
64  16.00   1.03   0        0.     0.       1.03
65  17.00   1.03   0        0.     0.       1.03
66  18.00   1.03   0        0.     0.       1.03
67  19.00   1.03   0        0.     0.       1.03
68  20.00   1.03   0        0.     0.       1.03
69  21.00   1.03   0        0.     0.       1.03
70  22.00   1.03   0        0.     0.       1.03
71  23.00   1.03   0        0.     0.       1.03
72   0.     1.04   0        0.     0.       1.04
73   1.00   1.04   0        0.     0.       1.04
74   2.00   1.04   0        0.     0.       1.04
75   3.00   1.04   0        0.     0.       1.04
```

```
93   21.00  1.04   33.                            
94   22.00  1.04   33.
95   23.00  1.04   25.
96   0.     1.05   17.
97   1.00   1.05   12.
98   2.00   1.05    9.
99   3.00   1.05    7.
100  4.00   1.05    7.
101  5.00   1.05    9.
102  6.00   1.05   10.
103  7.00   1.05   11.
104  8.00   1.05   21.
105 10.00   1.05   46.
106 11.00   1.05   73.
107 12.00   1.05   91.
108 13.00   1.05  102.
109 14.00   1.05  110.
110 15.00   1.05  186.
111 16.00   1.05  407.
112 17.00   1.05  701.
113 18.00   1.05 1166.
114 19.00   1.05 1720.
115 20.00   1.05 1846.
116 21.00   1.05 1539.
117 22.00   1.05 1109.
118 23.00   1.05  725.
119  0.     1.05  476.
120  1.00   1.06  317.
121  2.00   1.06  217.
122  3.00   1.06  150.
123  4.00   1.06   99.
124  5.00   1.06   62.
125  6.00   1.06   38.
126  7.00   1.06   18.
127  8.00   1.06   10.
128  9.00   1.06    6.
129 10.00   1.06    5.
130 11.00   1.06    4.
131 12.00   1.06    3.
132 13.00   1.06    3.
133 14.00   1.06    3.
134 15.00   1.06    3.
135 16.00   1.06    3.
136 17.00   1.06    3.
137 18.00   1.06    3.
138 19.00   1.06    3.
139 20.00   1.06    3.
140 21.00   1.06    3.
141 22.00   1.06    3.
142 23.00   1.06    3.
143  0.     1.07    3.
144  1.00   1.07    3.
145  2.00   1.07    3.
146  3.00   1.07    3.
147  4.00   1.07    3.
148  5.00   1.07    3.
149  6.00   1.07    3.
150        1.07    3.
```

```
           PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
           1846.   1349.    468.      161.      11709.
                   SUM  24.99  21.29  3.71  11794.
                       ( 635.)( 941.)( 96.)( 333.97)
CFS
```

COMBINE HYDROGRAPHS

HYDROGRAPH AT STA   2 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	923.	674.	234.	80.	5894.
CMS	26.	19.	7.	2.	167.
INCHES		7.56	10.49	10.79	11.01
MM		191.97	266.38	274.18	279.66
AC-FT		334.	464.	470.	487.
THOUS CU M		412.	572.	589.	601.

HYDROGRAPH AT STA   2 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1046.	1349.	468.	161.	11789.
CMS	92.	38.	13.	5.	334.
INCHES		15.12	20.98	21.59	22.02
MM		383.94	532.77	548.37	559.33
AC-FT		669.	928.	955.	974.
THOUS CU M		825.	1145.	1178.	1202.

COMBINE HYDROGRAPHS

SUM OF 2 HYDROGRAPHS AT PLAN 1 RATIO 1

```
      3.     3.     3.     3.     3.     3.     3.     3.
      3.     3.     3.     3.    39.    23.    45.    42.
     26.    19.    15.    12.    13.    13.    16.    17.
     50.    84.   116.   142.   160.   235.   801.  1371.
   2554.  2557.  2199.  1702.  1262.   926.   512.   380.
    202.   144.   105.    76.    56.    41.    20.    10.
      3.     3.     3.     3.     3.     3.     3.     3.
      3.     3.     3.     3.     3.     3.     3.     3.
      3.     3.     3.     3.     3.     3.     3.     3.
      3.     3.     3.     3.     3.     3.     3.     3.
      3.     3.     3.     3.     3.     3.     3.     3.
      3.     3.     3.     3.     3.     3.     3.     3.
```

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2557.	2071.	796.	274.	19927.
CMS	72.	59.	23.	8.	564.
INCHES		6.76	10.39	10.71	10.84
MM		171.68	263.85	272.15	275.34
AC-FT		1027.	1578.	1628.	1647.
THOUS CU M		1267.	1947.	2008.	2031.

SUM OF 2 HYDROGRAPHS AT PLAN 1 RATIO 2

```
      6.     6.     6.     6.     6.     6.     6.     6.
      6.     6.     6.     6.    77.    46.    91.    84.
     51.    38.    29.    24.    23.    26.    31.    33.
     99.   168.   233.   284.   321.   471.  1603.  2741.
   5104.  5115.  4398.  3403.  2525.  1851.  1024.   759.
    404.   208.   209.   152.   113.    82.    40.    21.
      6.     7.     7.     6.     6.     6.     6.     6.
      6.     6.     6.     6.     6.     6.     6.     6.
      6.     6.     6.     6.     6.     6.     6.     6.
      6.     6.     6.     6.     6.     6.     6.     6.
      6.     6.     6.     6.     6.     6.     6.     6.
      6.     6.     6.     6.     6.     6.     6.     6.
```

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5115.	4142.	1591.	567.	39854.
CMS	145.	117.	45.	15.	1129.
INCHES		13.52	20.78	21.43	21.68
MM		343.35	527.71	544.30	550.69
AC-FT		2054.	3156.	3256.	3294.
THOUS CU M		2533.	3893.	4016.	4063.

HYDROGRAPH ROUTING

COMBINE HYDROGRAPH AT DAM 3 - NO BREACH

ISTAQ	ICOMP	ITAPE	IECON	ITAPE	JPLT	JPRT	JNAME	ISTAGE	ISTAGE	IAUTO
2	1	0	0	0	0	0	0	1	0	0

```
                NSTPS   NSTOL        LAG    AMSKK       X        TSK   STORA  ISPRAT
                  0       0        130.50      0        0        0.    -123.    -1

STAGE    123.00    125.10    129.40
FLOW     0.        336.00    1350.00   1015.00

SURFACE AREA=   25.    27.    29.    31.    32.    34.    36.    38.    40.
CAPACITY=       0.     26.    54.    83.    115.   148.   191.   220.   259.
ELEVATION=      123.   124.   125.   126.   127.   128.   129.   130.   131.

         CREL    SPWID   COGW    EXPW    ELEVL   COGL    CAREA   EXPL
         123.0   0.      0.      0.      0.      0.      0.      0.

                           DAM DATA
                   TOPEL   COGD    EXPD    DAMWID
                   130.5   3.1     1.5     421.

                   STATION   2, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW
1.      2.      3.      3.      3.      3.      3.      3.      3.
36.     33.     29.     24.     20.     16.     15.     9.      18.     28.     35.
18.     26.     43.     66.     92.     116.    146.    225.    399.    779.
1273.   1750.   2556.   2331.   1896.   1684.   1418.   1111.   846.    629.
462.    336.    275.    217.    167.    127.    96.     71.     52.     37.
25.     17.     12.     8.      6.      5.      4.      4.      3.      3.
3.      3.      3.      3.      3.      3.      3.      3.      3.      3.
3.      3.      3.      3.      3.      3.      3.      3.      3.      3.
3.      3.      3.      3.      3.      3.      3.      3.      3.      3.
3.      3.      3.      3.      3.      3.      3.      3.      3.      3.

STORAGE
0.      0.      0.      0.      0.      0.      0.      0.      0.
6.      5.      4.      3.      1.      1.      2.      3.      4.      5.
3.      2.      7.      11.     15.     19.     24.     37.     63.     104.
163.    230.    263.    258.    244.    219.    181.    143.    112.    88.
70.     57.     46.     36.     27.     21.     15.     11.     8.      6.
4.      3.      2.      1.      1.      1.      1.      1.      1.      1.
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.
0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

STAGE
123.0   123.0   123.0   123.0   123.0   123.0   123.0   123.0   123.0
123.0   123.0   123.0   123.0   123.0   123.0   123.1   123.1   123.1   123.2
123.2   123.2   123.2   123.1   123.1   123.1   123.1   123.1   123.1   123.2
```

PEAK OUTFLOW IS   2556. AT TIME 43.00 HOURS

		PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
	CFS	2556.	1928.	792.	274.	19924.
	CMS	72.	55.	22.	8.	564.
	INCHES		6.29	10.34	10.71	10.86
	MM		159.81	262.57	272.15	275.30
	AC-FT		956.	1570.	1628.	1647.
	THOUS CU M		1179.	1937.	2008.	2031.

STATION   2, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

2.	4.	5.	6.	6.	6.	6.
6.	6.	6.	8.	8.	18.	36.
72.	67.	38.	48.	33.	29.	29.
35.	51.	85.	131.	228.	292.	495.
3389.	5194.	5074.	4611.	3598.	2055.	1733.
921.	685.	498.	356.	283.	176.	134.
49.	33.	23.	16.	12.	8.	7.
6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.

STORAGE

0.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	3.	9.
11.	11.	9.	8.	5.	5.	5.
6.	8.	14.	21.	30.	38.	49.	73.
280.	309.	308.	300.	284.	267.	250.	226.
120.	94.	74.	59.	47.	37.	29.	22.
8.	5.	4.	3.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.

STAGE

123.0	123.0	123.0	123.0	123.0	123.0	123.0
123.0	123.0	123.0	123.1	123.1	123.1	123.2	123.3	123.4
123.4	123.4	123.4	123.3	123.2	123.2	123.2	123.2
123.2	123.3	123.5	123.8	124.1	124.4	124.8	125.7	127.1	129.4

PEAK OUTFLOW IS   5194. AT TIME 42.00 HOURS

		PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS		5194.	4001.	1584.	567.	39848.
CMS		147.	113.	45.	15.	1128.
INCHES			13.06	20.68	21.43	21.68
MM			331.72	525.34	544.31	550.61
AC-FT			1984.	2142.	3256.	3292.
THOUS CU M			2447.	3876.	4016.	4062.

123.3 123.2 123.1 123.1 123.1 123.1 123.1 123.0 123.0 123.0
123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0
123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0
123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0
123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0
123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0
123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0
123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0
123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0 123.0

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FORMULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO 1 0.50	RATIO 2 1.00	RATIOS APPLIED TO FLOWS
HYDROGRAPH AT	1	2.02 (0.00)	1 (	1788. 50.63)(	3976. 101.25)(	
HYDROGRAPH AT	2	0.83 (0.00)	1 (	923. 26.16)(	1846. 52.27)(	
2 COMBINED		2.85 (0.00)	1 (	2557. 72.42)(	5115. 144.86)(	
ROUTED TO	2	2.85 (0.00)	1 (	2556. 72.37)(	5194. 147.08)(	

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	ELEVATION	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
		123.00	123.00	130.50
	STORAGE	0.	0.	239.
	OUTFLOW	0.	0.	1815.

RATIO OF PHF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	131.10	0.60	263.	2556.	3.00	43.00	0.
1.00	132.23	1.73	309.	5194.	7.00	42.00	0.

```
***********************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION    JULY 1978
LAST MODIFICATION  26 FEB 79
MODIFIED FOR HONEYWELL APR 79
***********************

***********************
THIS PROGRAM IS CURRENTLY BEING MODIFIED
TO RUN ON THE CGS HONEYWELL SYSTEM

PLEASE REPORT ANY UNUSUAL OPERATING PROBLEMS
TO MIKE TILLSON (RM. 423) PH: 7-5666
***********************
 1    A      AIKEN RUCHELLE RESERVOIR NO 3
 2    A      PMF WITH RATIOS WITH BREACH
 3    A DATE
 4    B   150    1     0     0     0     0     0     0
 5    B1    5
 6    J     1    2     1
 7    J1   .5    1
 8    K     0    1
 9    K1  INFLOW HYDROGRAPH
10    M     1    1   2.02  2.02    0     0     1     0
11    P     0   22   112   123   133   142
12    T     1                                  .1    1
13    M  3.34   .6
14    X     3    3     1                        1     1
15    X     0    2                              1
16    K1  INFLOW HYDROGRAPH 2
17    M     1    1    .83
18    P     0   22   112   123   133   142     1     1
19    T                                        .1
20    M  1.94   .52
21    X     3    3     1                        1     1
22    K     2
23    K1  COMBINE HYDROGRAPHS
24    K     1    2                              1     1
25    K1  COMBINE HYDROGRAPH AT DAM 3 WITH BREAK
```

```
TI                                                                    67-   1

Y6   123    125.1   129.4   130.5
Y5   0      336     1550    1815
8A   25.1   26.9    28.7    30.6    32.4    34.2    36.6    37.9    39.7
8E   123    124     125     126     127     128     129.2   130     131
8B   123
8D   130.5  3.087   1.5     421
8B   20     .5      99      2       128     130.5
K    1      4040

KL LOCATION TOE DAM 3
Y    1
Y1   1      1       1
Y6   .05    .05     96      135     40      .69
Y7   0      125     250     110     850     110     1020    1060    96
Y7   1250   110     1650    122     2050    135     1020
K    1      7540                                            1

KL LOCATION CREST DAM 2
Y    1              1       1
Y1   1      1
Y6   .05    .05     95      130     3500    3000.
Y7   0      110     100     100     200     250
Y7   450    100     500     105     550     110
K    1      7590                                            1

KL LOCATION TOE DAM 2
Y    1              1       1
Y1   1
Y6   .05    .05     86      120     50      .18     95      350     85
Y7   0      100     100     190     90      190     200
Y7   200    90      300     90      500     500
K    1      10790

KL LOCATION FLAT SECTION
A    1              1       1
```

X1 LOCATION NARROW SECTION

Y6	0.	60.	60.	50.	19	100	3200	800.	1000	19
Y7	0	90	90	200	80	400	70	900	1000	19
YA	1400	70	1700	2000	90	100		1	
X	1 11790				1			
Y					1	1		
Y1	1							
Y6	.05	.05	.05	60	90	1000	100.	60	60
Y7	0	90	40	80	110	70	200	60	440
Y7	600	70	700	75	800	80			
X	99							
◄								
◄								
◄								
◄								
◄								

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	123.00	123.00	130.50
STORAGE	0.	0.	239.
OUTFLOW	0.	0.	1815.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	131.09	0.59	262.	10685.	1.52	46.00	43.00
1.00	131.66	1.16	286.	10685.	1.96	43.00	41.00

PLAN 1   STATION 4040

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	10674.	99.2	46.00
1.00	10686.	99.3	43.00

PLAN 1   STATION 7540

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	5705.	105.1	46.00
1.00	9451.	107.7	43.00

PLAN 1   STATION 7590

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	3696.	91.8	46.00
1.00	9452.	92.7	43.00

PLAN 1   STATION 10790

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	3947.	65.0	47.00
1.00	8941.	65.7	43.00

PLAN 1   STATION 11790

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
0.50	6052.	66.6	47.00
1.00	8653.	68.0	43.00

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FORMULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN	RATIO 1 0.50	RATIO 2 1.00
HYDROGRAPH AT	1	2.02 (0.00)	1	1788. (50.63)(	3576. (101.25)(
HYDROGRAPH AT	2	0.83 (0.00)	1	923. (26.14)(	1846. (52.27)(
2 COMBINED		2.85 (0.00)	1	2557. (72.42)(	5115. (144.84)(
ROUTED TO	2	2.85 (0.00)	1	10685. (302.57)(	10685. (302.57)(
ROUTED TO	4040	2.85 (0.00)	1	10674. (302.26)(	10686. (302.61)(
ROUTED TO	7540	2.85 (0.00)	1	5705. (161.54)(	9451. (267.62)(
ROUTED TO	7590	2.85 (0.00)	1	5696. (161.30)(	9452. (267.64)(
ROUTED TO	10790	2.85 (0.00)	1	5947. (168.39)(	8941. (253.18)(
ROUTED TO	11790	2.85 (0.00)	1	6052. (171.36)(	8653. (245.02)(

APPENDIX E

REFERENCES

APPENDIX E

REFERENCES

1) U.S. Department of Commerce, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, May 1961.

2) H.W. King and E.F. Brater, Handbook of Hydraulics, 5th edition, McGraw-Hill, 1963.

3) University of the State of New York, Geology of New York, Education Leaflet 20, Reprinted 1973.

4) Elwyn E. Seelye, Design, 3rd edition, John Wiley and Sons, Inc., 1960.

APPENDIX F

DRAWINGS
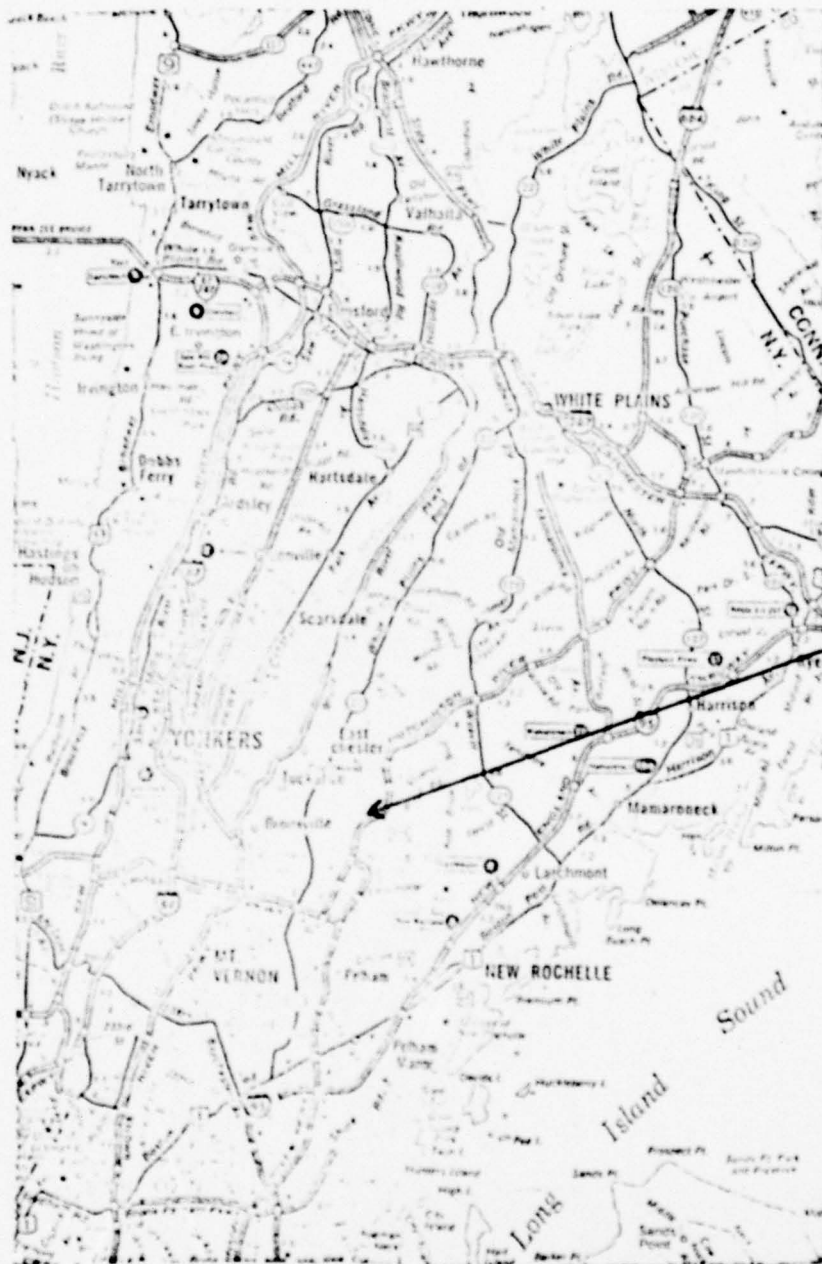
DAM SITE

VICINITY MAP
NEW ROCHELLE RESERVOIR
No. 3 DAM

TOPOGRAPHIC MAP
NEW ROCHELLE RESERVOIR
No. 3 DAM

Form IW3c. 11-5-14-1000 (10-1035)

Acc. 383

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

DAM REPORT

June 22nd, 1915.

(Date)

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Reservoir No 3 New Rochelle Water Co. Dam.

This dam is situated upon the Hutchinson River

(Give name of stream)

in the Town of East Chester, Westchester County,

about 3 - 4 miles from the Village or City of New Rochelle

(State distance)

The distance up stream from the dam, to the No 1 dam,

(Up or down)   (Give name of nearest important stream or of a bridge)

is about ½ mile

(State distance)

The dam is now owned by N. R. Water Co (Iselin Estate

(Give name and address in full)

and was built in or about the year 1908, and was extensively repaired or reconstructed

during the year —————.

As it now stands, the spillway portion of this dam is built of Concrete Gravel + 4"x10" Timber

(State whether of masonry, concrete or timber)

and the other portions are built of Concrete & Earth fill + bank

(State whether of masonry, concrete, earth or timber with or without rock fill)

As nearly as I can learn, the character of the foundation bed under the spillway portion

of the dam is Rock and under the remaining portions such

foundation bed is Rock

215 B

N.R. Water Co
Reservoir No 3

200' ⟶|← 25 →|← 200'

spillway

20'

Dam

Foot Bridge

Flow of Stream

ELECTRIC RAIL ROAD

N.R. Water Co
Reservoir No 2
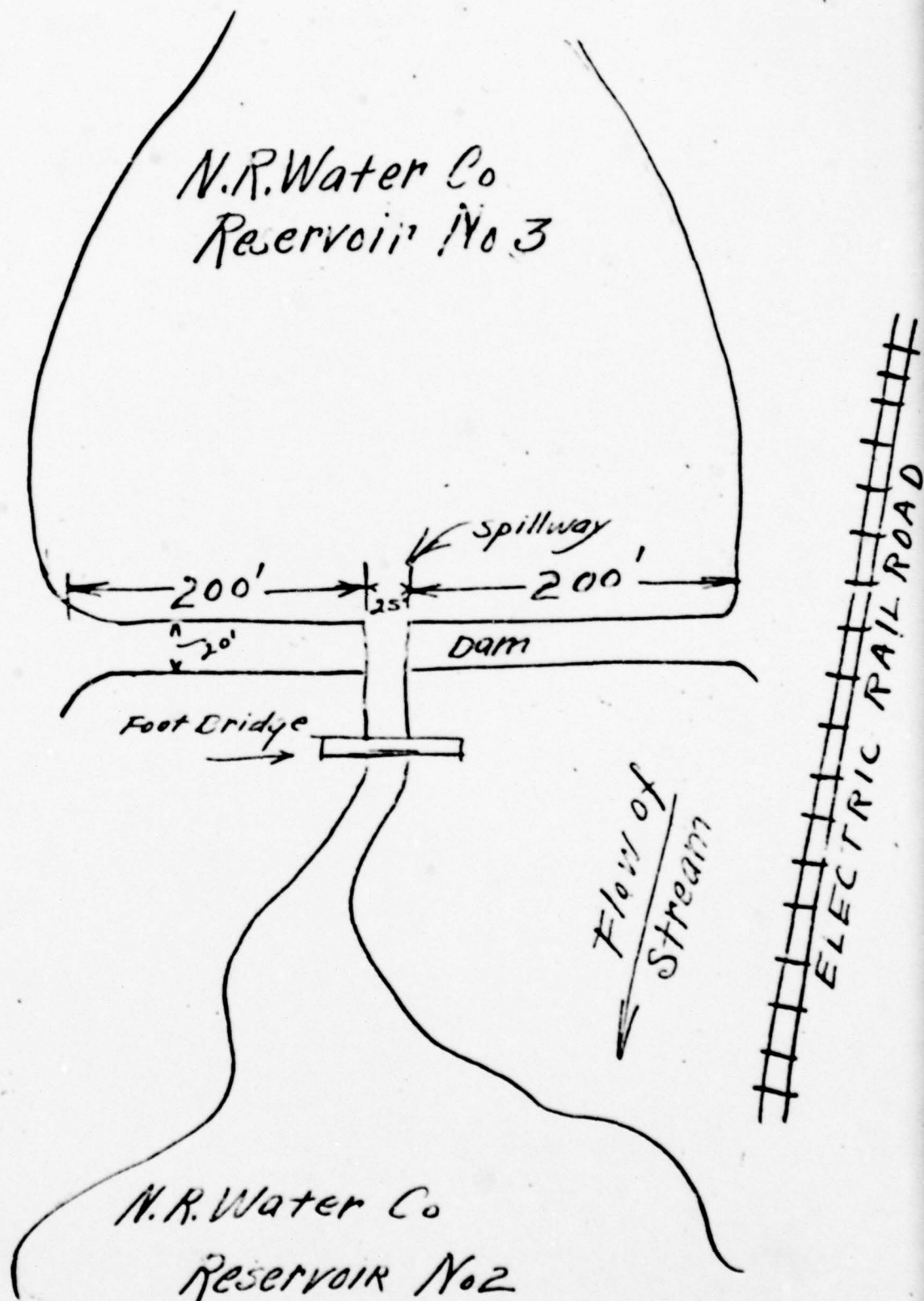
(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)

20'

10'

4"x10"

3'

ABOUT 30'

Rock + Earth Covering

CONCRETE

42" FIFE

SPILLWAY SECTION

20'

POND

ABOUT 30'

Rock + Earth Covering

CONCRETE CENTER.

ROCK & GRAVEL FACE

SECTION REST OF DAM
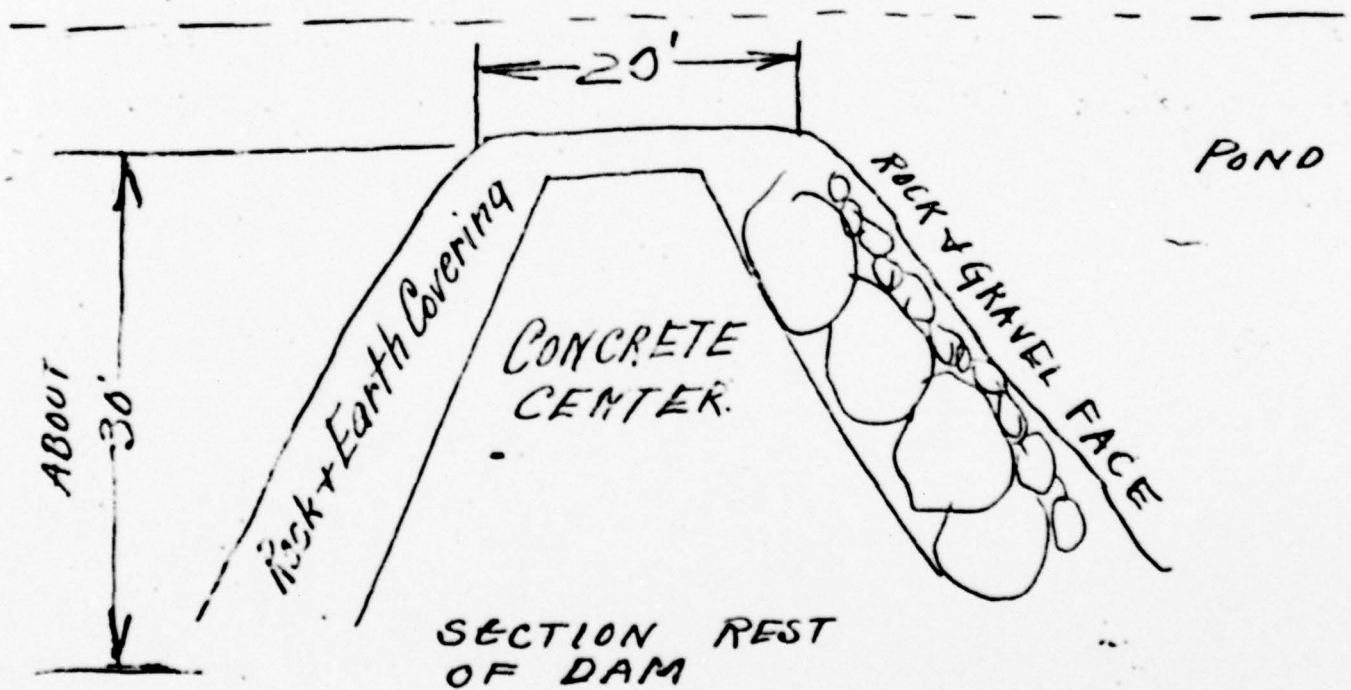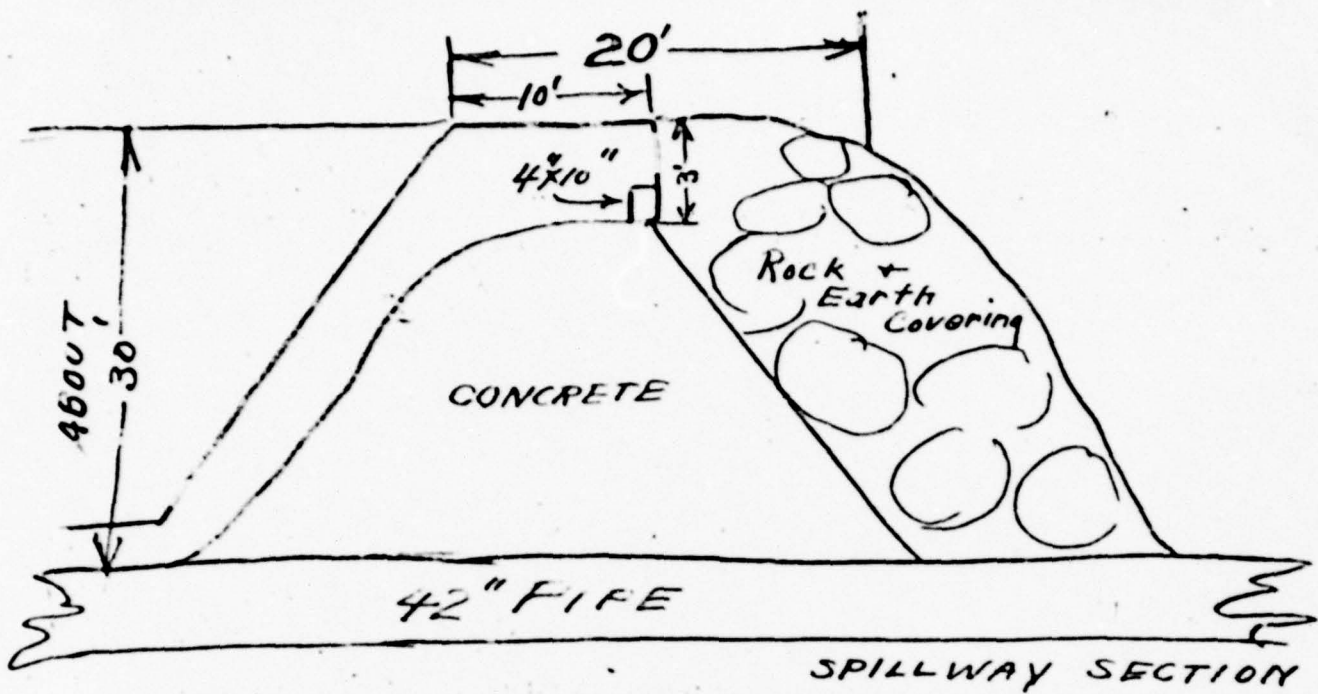
The total length of this dam is _____450_____ feet. The spillway or waste-weir portion, is about _____25_____ feet long, and the crest of the spillway is about _____3_____ feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: Two 12" pipes and a 24" pipe all leading into a 42" pipe

At the time of this inspection the water level above the dam was _____2_____ ft. _____6_____ in. ~~above~~ below the crest of the spillway.

(State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)

This dam was also in Excellent condition and well taken care of. Should a rupture of the dam occur the flow would no doubt be taken care of by the reservoir just below it (No 2)

Reported by _____L D Seymour_____
(Signature)

Box 178
(Address—Street and number, P. O. Box or R. F. D. route)

Wolcott N.Y.
(Name of place)
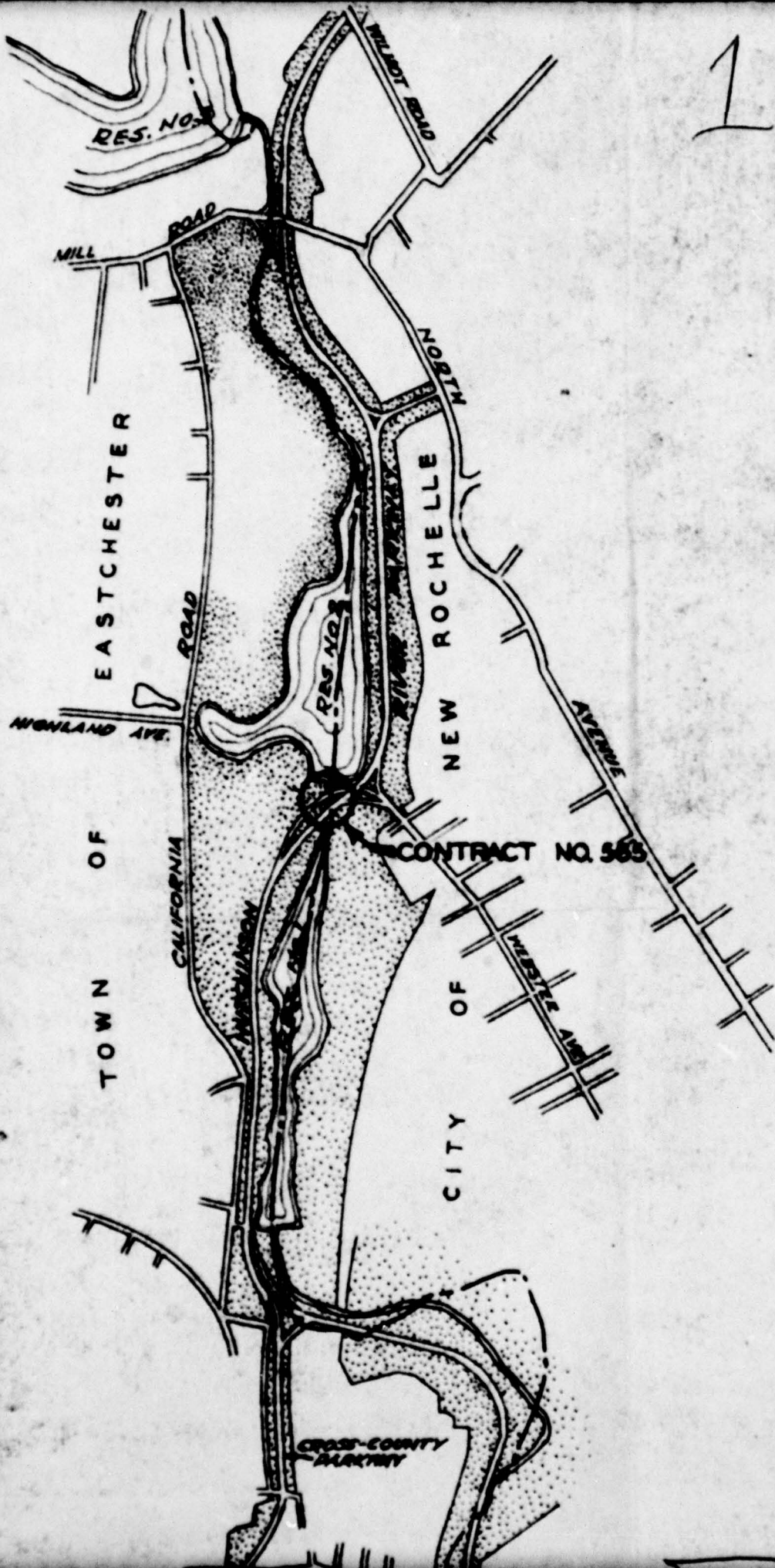
WHERE NECESSARY, ON THE UPS
119.0± AND 126.5±, RELAY THE EX
AS DIRECTED UNDER ITEM NO. 2

— 120 —

— 125 —

ITEM NO.2

COREWALL OF EARTH DAM

BRIDLE PATH

PLACE 12' DRY
STONE PAVING
ITEM NO. 78.

— 125 —

— 120 —

EASTCHESTER SANITARY SEWER

REMOVE ALL TREE
SIMILAR GROWTH ON
THIS AND INDICATED AREAS O
FILL ALL HOLES WIT
SELECTED MATERIAL, SPREAD
AND SEED. INCLUDED UNE
NOS. 2, 40 AND 71.

RESERVOIR
NO.2

INV. EL. 98.3±

INV. EL. 98.8±

INV. EL. 98.0±

REPAIRING & REPAIN
BLOWOFF OUTLET
UNDER ITEM NO.

INV. EL. 107.0±

N THE UPSTREAM FACE OF DAM BETWEEN
THE EXISTING 12" DRY STONE PAVING

INV. EL. 113.5±

START OF CONTRACT

PLACE 16" DRY PAVING
ITEM NO. 79

RELAY

RECONSTRUCT EXISTING
DAM SPILLWAY.

—115

110

ALL TREES, SHRUBS AND OTHER
OWTH ON DAM SLOPES WITHIN
AREAS OR AS DIRECTED.
HOLES WITH COMPACTED,
SPREAD TOP SOIL, GRADE,
LUDED UNDER ITEMS
AND 71.

42" BLOWOFF PIPE

FROM WEBSTER

0+90

1+0
INV. EL.

110

110

115

4

REPAINTING
TLET PIPING
M NO. 9

NOTE: THE OUTLET PIPING AS
SHOWN, IS FROM AN OLD
PLAN THE COMPLETENESS
OR ACCURACY OF WHICH
IS UNCERTAIN, AND IS ONLY
INTENDED TO TYPIFY THE
CONDITIONS WHICH MAY BE
FOUND.

120

ELAX THE EXISTING DRY STONE PAVING
AS DIRECTED. ITEM NO. 78.
125

COREWALL OF EARTH DAM

125

ITEM NO. 2

120

115

STER   AVE

PARKWAY

NORTHBOUND

EXIT TO WEBST

CROSS-COUNTY
PARKWAY
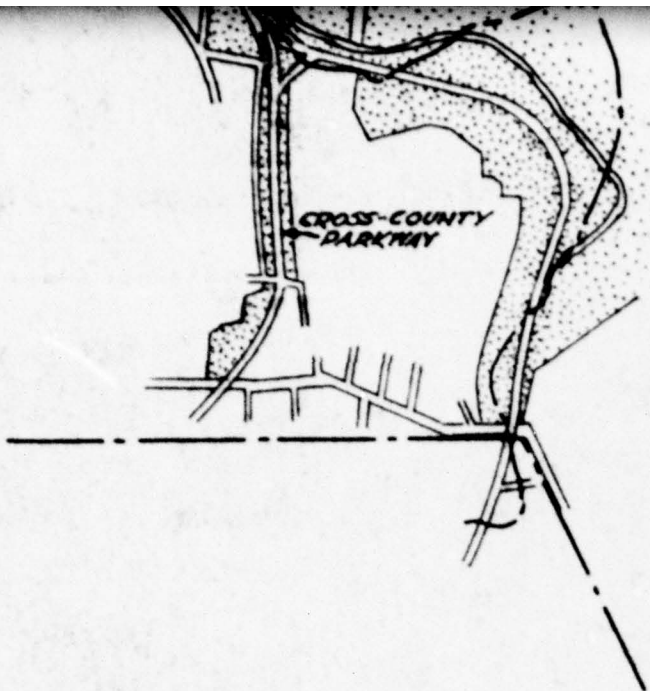
5

LOCATION MAP
1 INCH=1000 FEET

APPROVED FOR: DATE: May 20
WESTCHESTER COUNTY PARK COMMISSION

GENERAL SUPERINTENDENT

MADE BY C.J.S. Mar. 1929.
TRACED BY C.J.S. Apr. 1929.
CHECKED BY J.W.H.

WOOD
BRIDGE
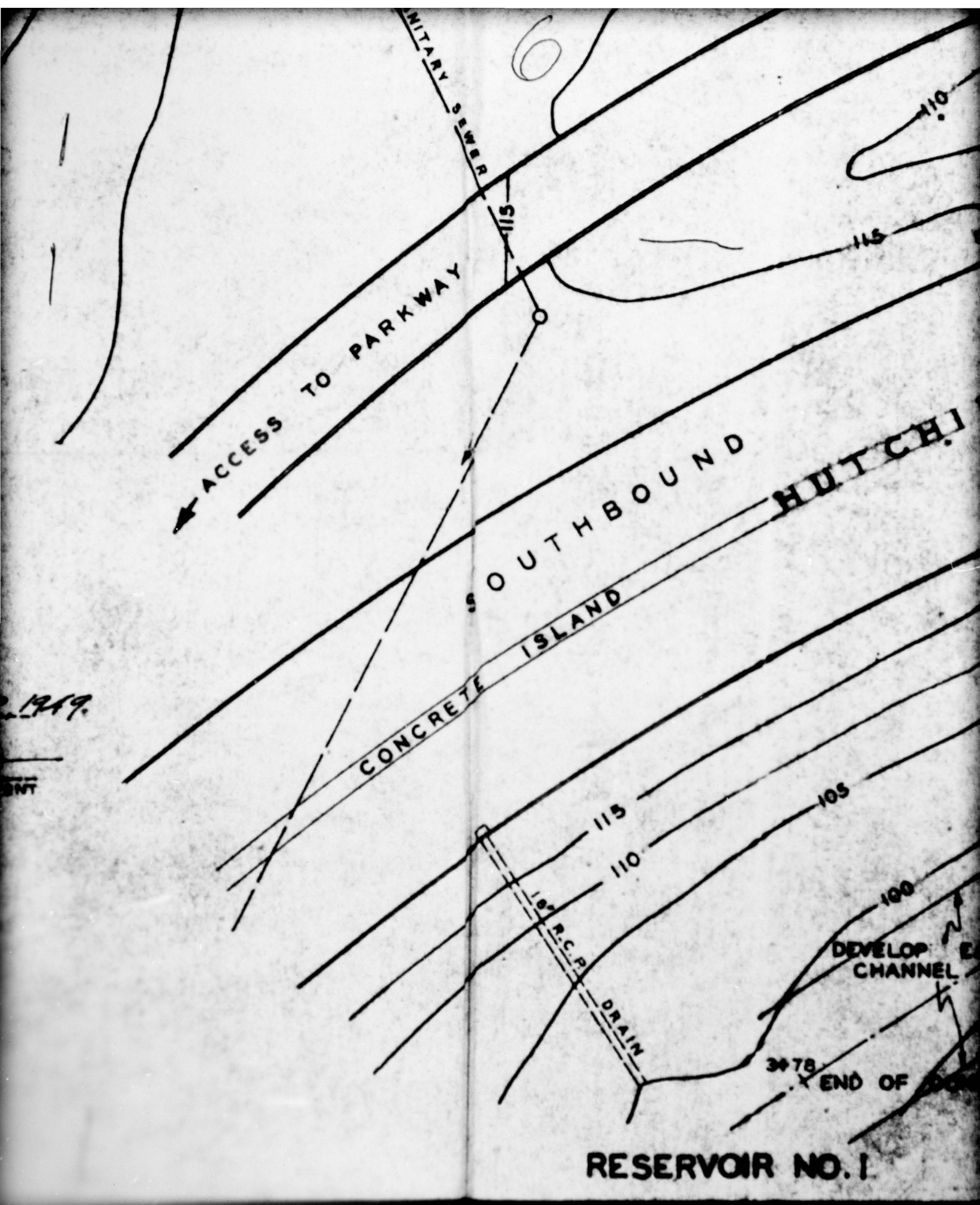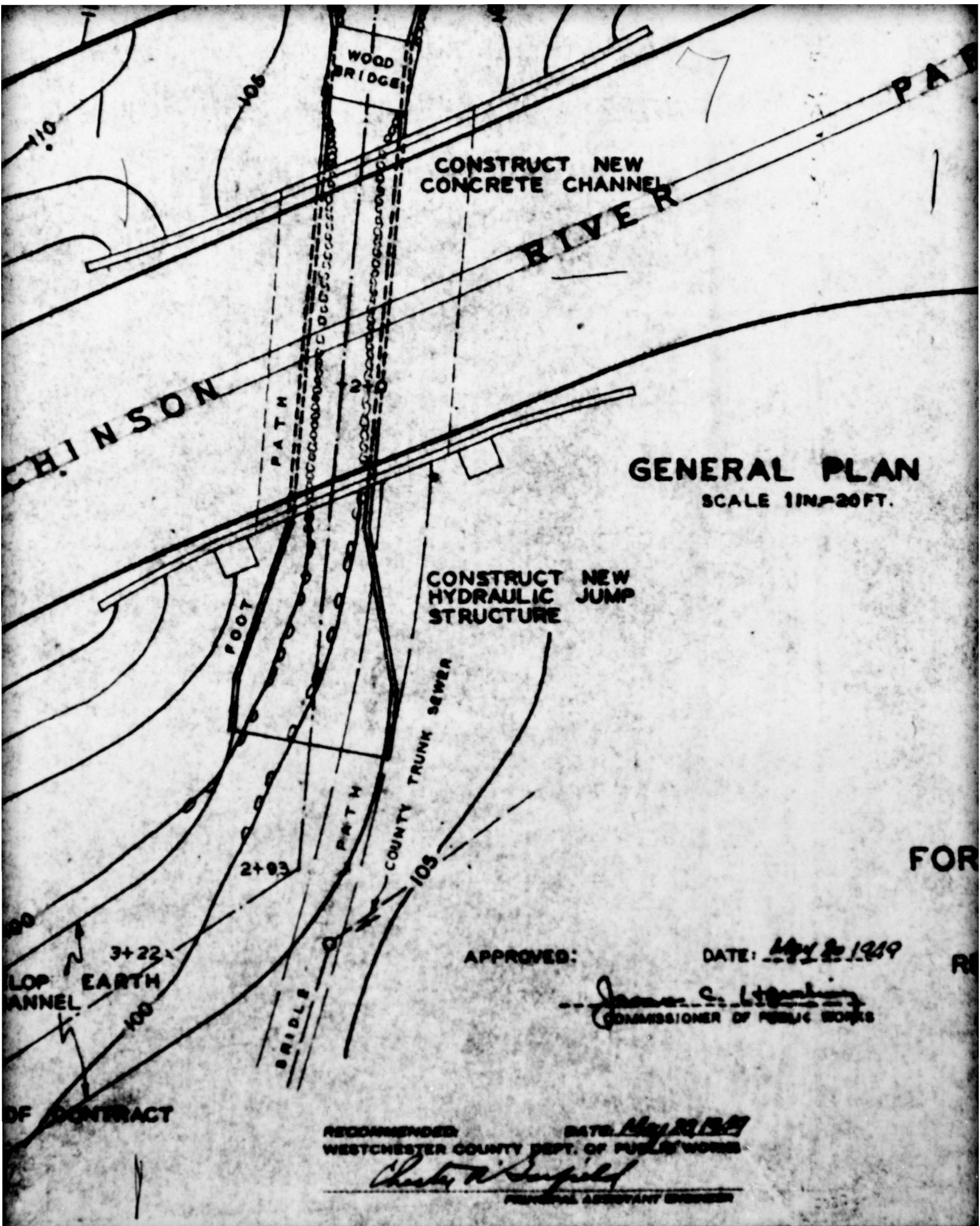
CONSTRUCT NEW
CONCRETE CHANNEL

RIVER

PAR

CHINSON

PATH

2+0

GENERAL PLAN

SCALE 1 IN.=20 FT.

FOOT

CONSTRUCT NEW
HYDRAULIC JUMP
STRUCTURE

COUNTY TRUNK SEWER

PATH

105

FOR

2+93

3+22

APPROVED: DATE: May 20 1949

EARTH

BRIDLE

100

COMMISSIONER OF PUBLIC WORKS

OF CONTRACT

PARK

EXIT TO WEBSTER AVENUE

AL PLAN
LE 1IN=20FT.

WESTCHESTER COUNTY
DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING
PLANS
FOR RECONSTRUCTION OF SPILLWAY
AND
IMPROVEMENT OF CHANNEL
AT
RESERVOIRS NO.2 & NO.I-HUTCHINSON RIVER
IN
TOWN OF EASTCHESTER AND
CITY OF NEW ROCHELLE
N.Y.

APRIL 1949

May 2, 1949

PUBLIC WORKS

START OF CONTRACT

BASE LINE

SECTION X-X

0+0

130

127.5

115 120 125 127

125 127

115 120 125 127

110 115 120 125 127

COMPACTED FILL
ITEM NO. 20

...VE PORTION OF
...NG CORE-WALL AND
...CONCRETE SPILLWAY.
...3. EXCAVATE TO
...2. REPLACE AS
...DIRECTED.
...4, 3, 14, 15, 18, & 20
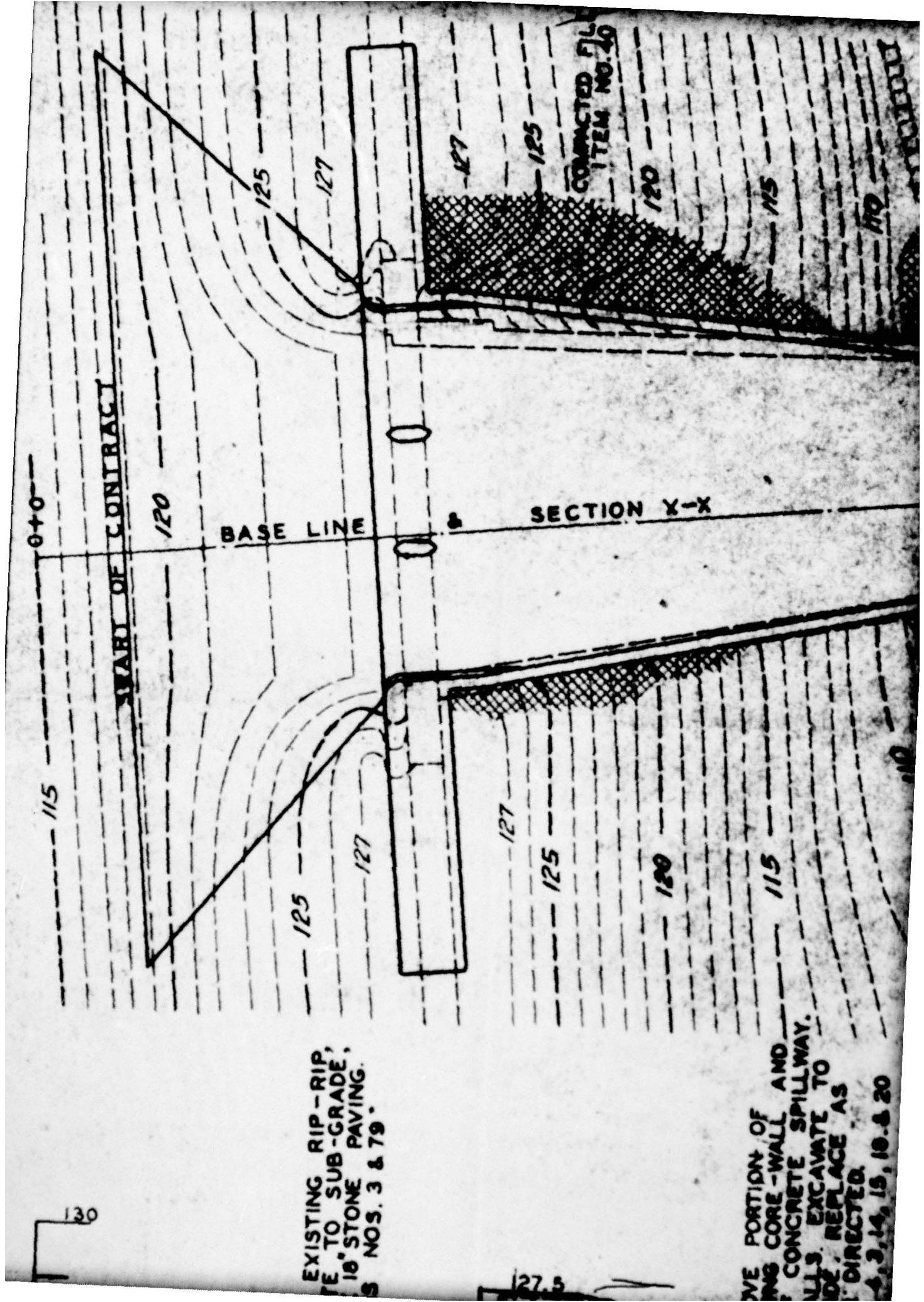
...EXISTING RIP-RAP,
...TE TO SUB-GRADE,
...18" STONE PAVING.
...S NOS. 3 & 79.

DRIVE

110

ACCESS M.

110

110

110

110

110

TYPICAL WEEP HOLE
TO WEEP HOLE DRAIN
SEE DETAIL. ITEM 6

COMPACTED
ITEM

PL
SCALE 1 IN

NO. 70

PLAN
SCALE 1 IN. = 10 FEET.

SOUTHBOUND

HUTCHINSON

NORTHBOUND

RELOCATE
BRIDLE PATH

14" C.I. PIPE SEWER

TRUNK SEWER MANHOLE
INV. EL. 100.25

18" STONE PAVING ITEM NO. 78

27" CONC. PIPE

24" STONE PAVING
ITEM NO. 80

2+50

2+52

104

105

99

3+22

18" STONE PAVING

100

99

105

110

115

117

CONTINUE NEW EXCAVATED
CHANNEL TO STATION 5±78
END OF CONTRACT.

REMOVE EXISTING RIP-RIP,
EXCAVATE TO SUB-GRADE,
PLACE 18" STONE PAVING.
ITEMS NOS. 3 & 79.

REMOVE PORTION OF
EXISTING CORE-WALL AND
PART OF CONCRETE SPILLW
REMOVE WALLS, EXCAVATE TO
SUB-GRADE, REPLACE AS
SHOWN OR DIRECTED.
ITEMS NOS. 4, 3, 14, 15, 18 & 20

EXISTING RIP-RAP

119.0

27.5

120.0

CENTER-LINE OF EXISTING CORE-WALL

5

130
125
120
115
110
105
100
95
90

0+0   0+08   0+34   0+50   0+62
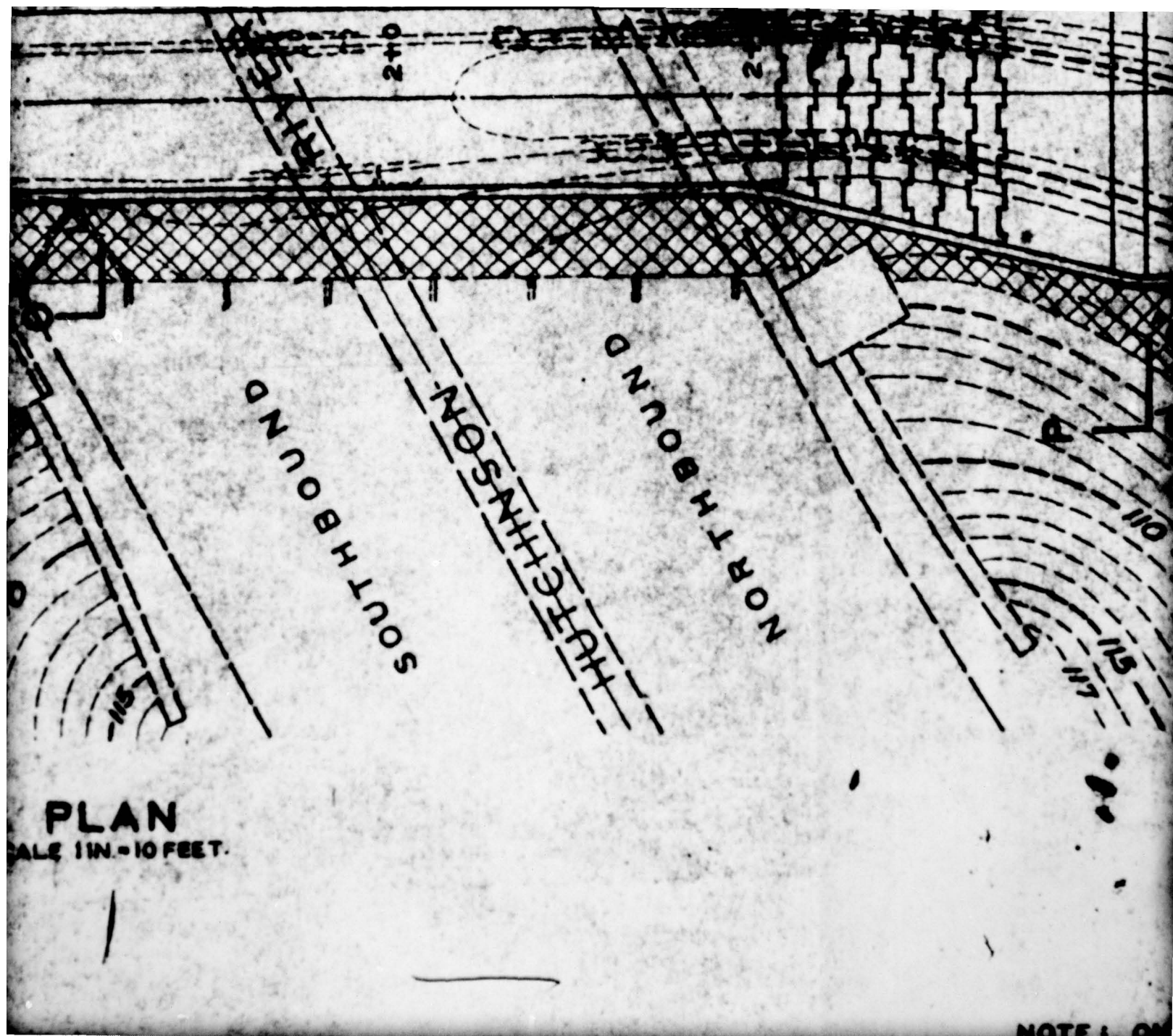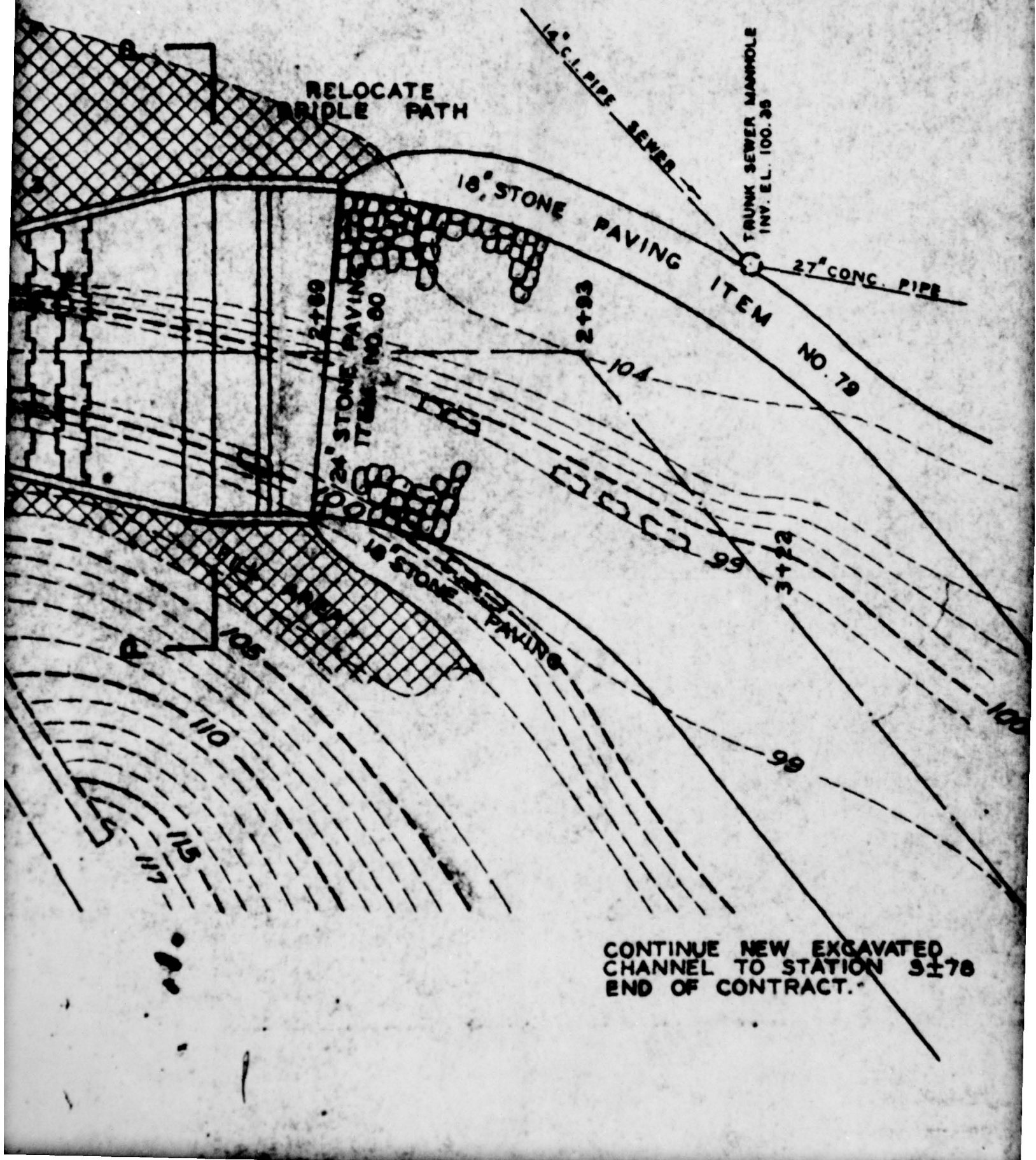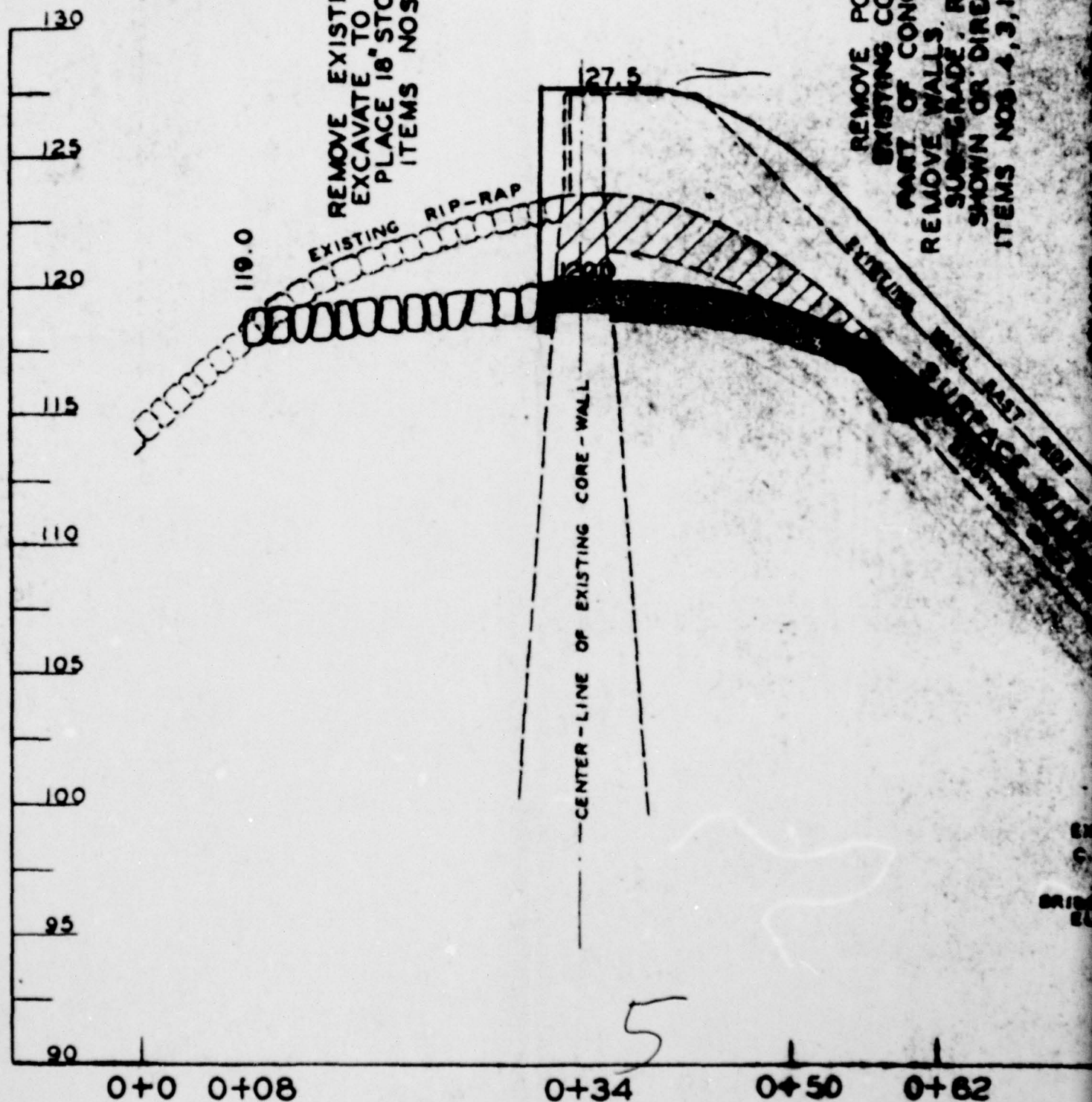
MADE BY _____ CJS _Apr. 1949_
TRACED BY _J.S. & CJS._
CHECKED BY _J.H.W._

PAVING, CONSTRUCT NEW WALLS AS
SHOWN OR DIRECTED, ITEM NOS. 4,14,15,16,1

{EAST SIDE EL. 106.7} TOP OF NEW SPILLWAY WALLS
{WEST SIDE EL. 106.7}   AT ACCESS BRIDGE.

UNDERSIDE OF BRIDGE ON SECTION X-X
ELEV. 106.2

REMOVE 42"C.I. PIPE ABOVE GRADE OF NEW
SPILLWAY AND CHANNEL. ITEM NO. 5.

WEBSTER AVENUE ACCESS BRIDGE
SOUTHBOUND TRAFFIC ONLY

UNDERSIDE OF BRIDGE ON SECTION X-X
ELEV. 105.7

INCORPORATE DRAIN PIPES IN NEW
CHANNEL WALLS. BOTH SIDES.

REMOVE WOOD BRIDLE PATH BRIDGE
INTACT AND REPLACE TO POSITION
AS SHOWN OR DIRECTED. ITEM NO. 70

105.0

105.0

TOP O

BRIDGE WE

DRAIN

12"DRAIN

12"DRAIN

EXISTING

CHANNEL

GR

OF "GUNITE"

PAVING

EXISTING 42"
C.I. PIPE
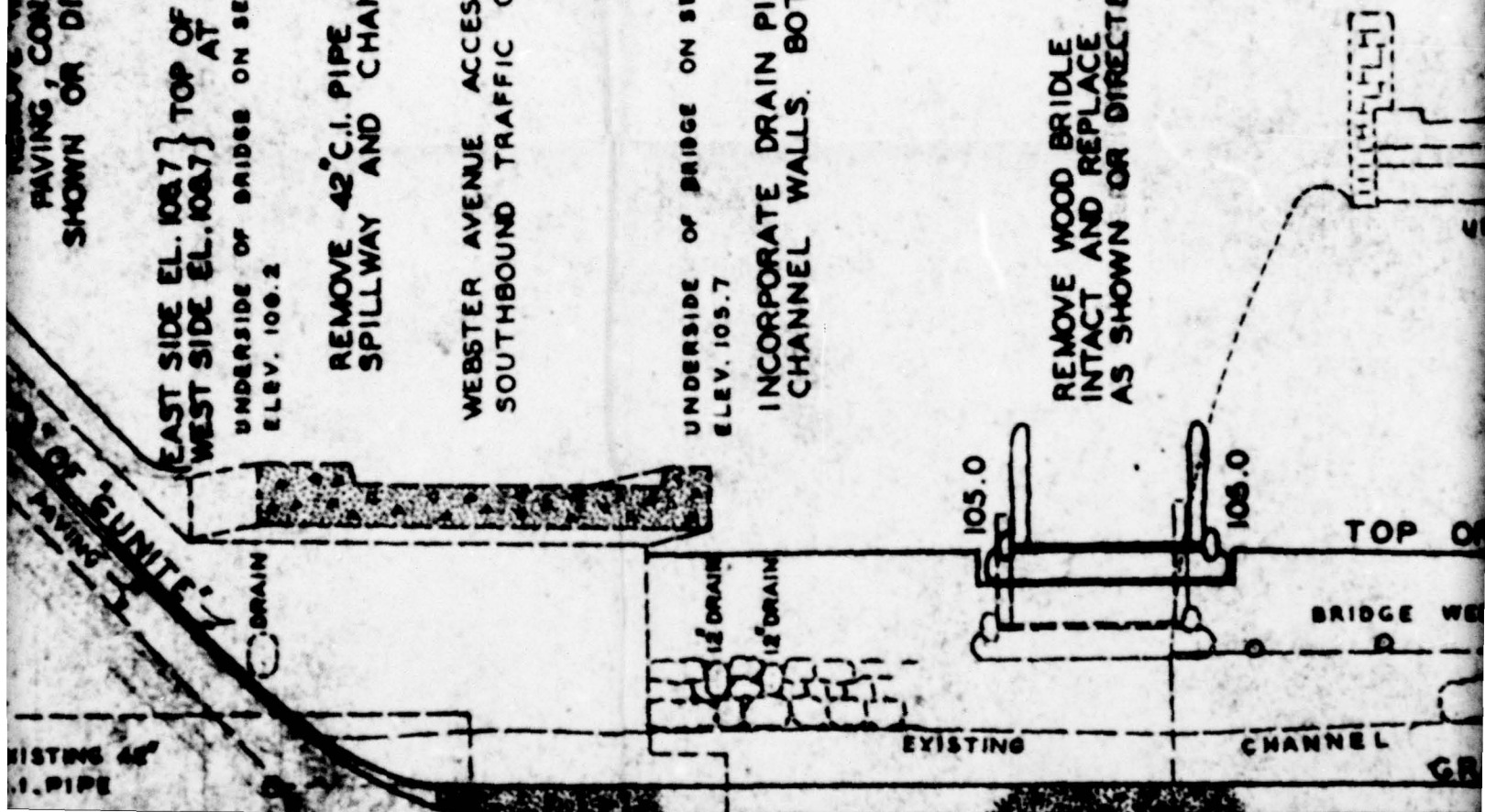
NOTE: ON THIS P
STRUCTURE
PROPOSED

HUTCHINSON RIVER PARKWAY

SOUTHBOUND   NORTHBOUND

UNDERSIDE OF BRIDGE ON SECTION X-X ELEV. 115.9

CONCRETE CHANNEL WAL
BY RUSTIC FENCE (SEE
SOUTHERLY END. ITEM

104.0

NEW CHANNEL WALLS

EEP HOLES

SPRINGING LINE OF BRIDGE   EL. 101.8

BOTTOM

ADE 0.50 %

97.31
97.25

95.25

BRIDGE FOOTINGS ELEV. 94.8

2+0   2+28   2+50

RECOMMENDED: DATE: May 20, 1949.
WESTCHESTER COUNTY DEPT. OF PUBLIC WORKS

Charles A. Benfield

PRINCIPAL ASSISTANT ENGINEER

NOTE: ON THIS PLAN, IN GENERAL, DASH LINES SHOW EXISTING STRUCTURES AND TOPOGRAPHY, SOLID LINES DENOTE PROPOSED WORK INCLUDED UNDER THIS CONTRACT.

CONCRETE CHANNEL WALLS, BOTH SIDES, TO BE SURMOUNTED BY RUSTIC FENCE (SEE DETAIL), FROM ACCESS BRIDGE TO SOUTHERLY END. ITEM NO. 73-A.

104.0

98.0

98.00

95.25

28   2+50 2+58   2+69   3+0

RELAY 12" DRY STONE PAVING
AS DIRECTED. ITEM NO. 78.

EXISTING STONE PAVING

APPROXIMATE LIMITS OF
EXISTING RIP-RAP
NEW 18 STONE

119

121

123

120

125

127

A

125

CENTER LINE OF EXISTING COREWALL

COREWALL AT ELEV. 119.0

STO

127

125
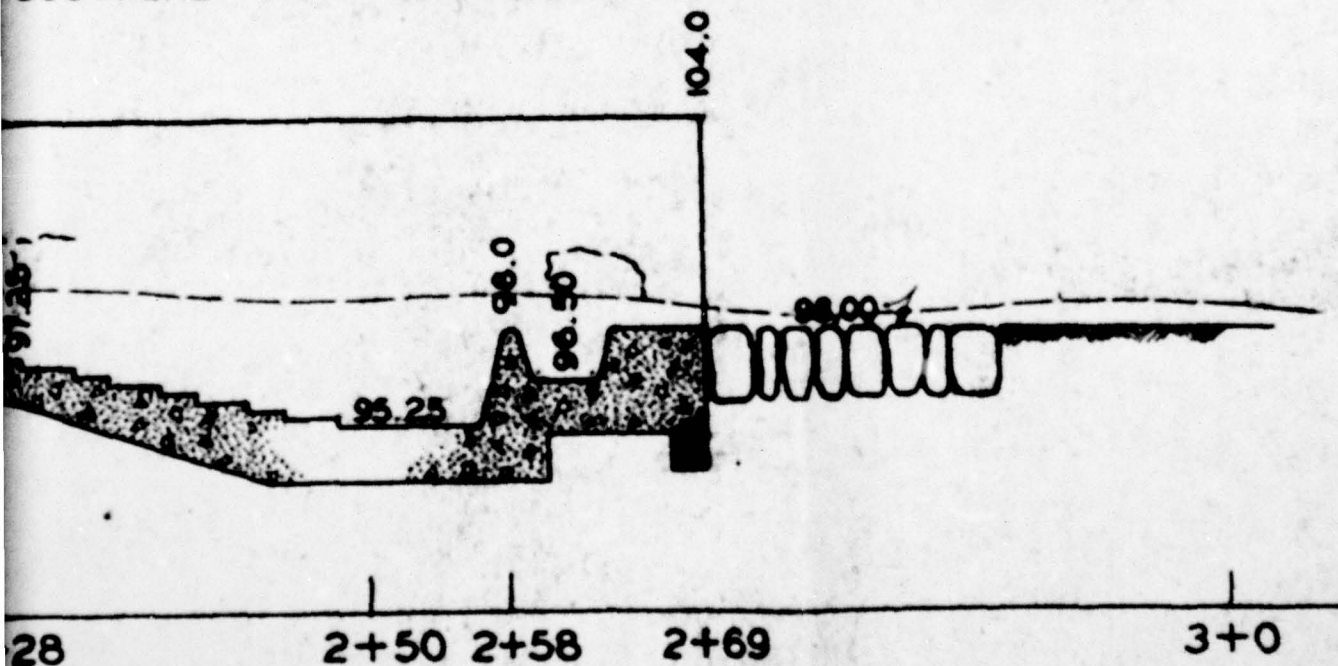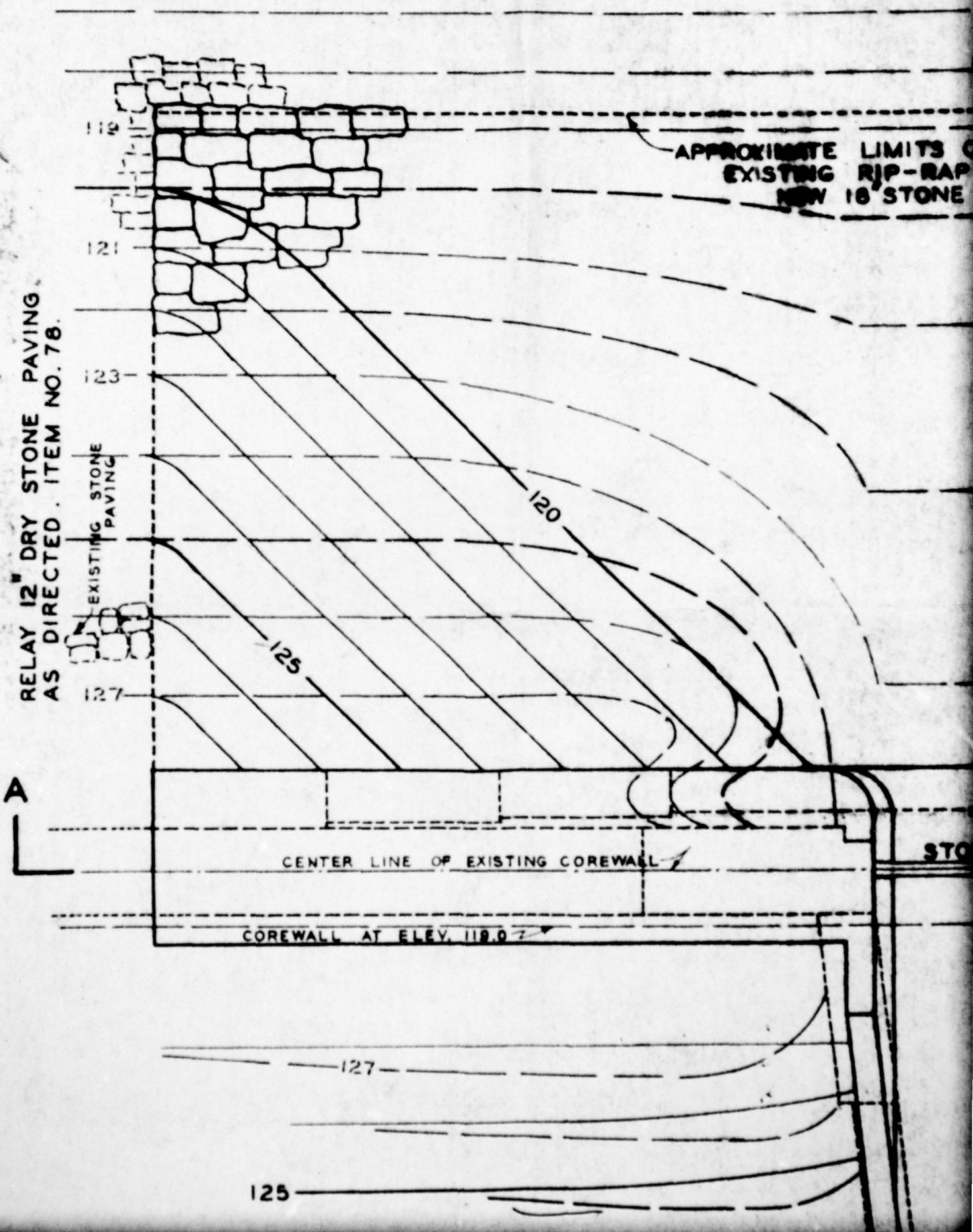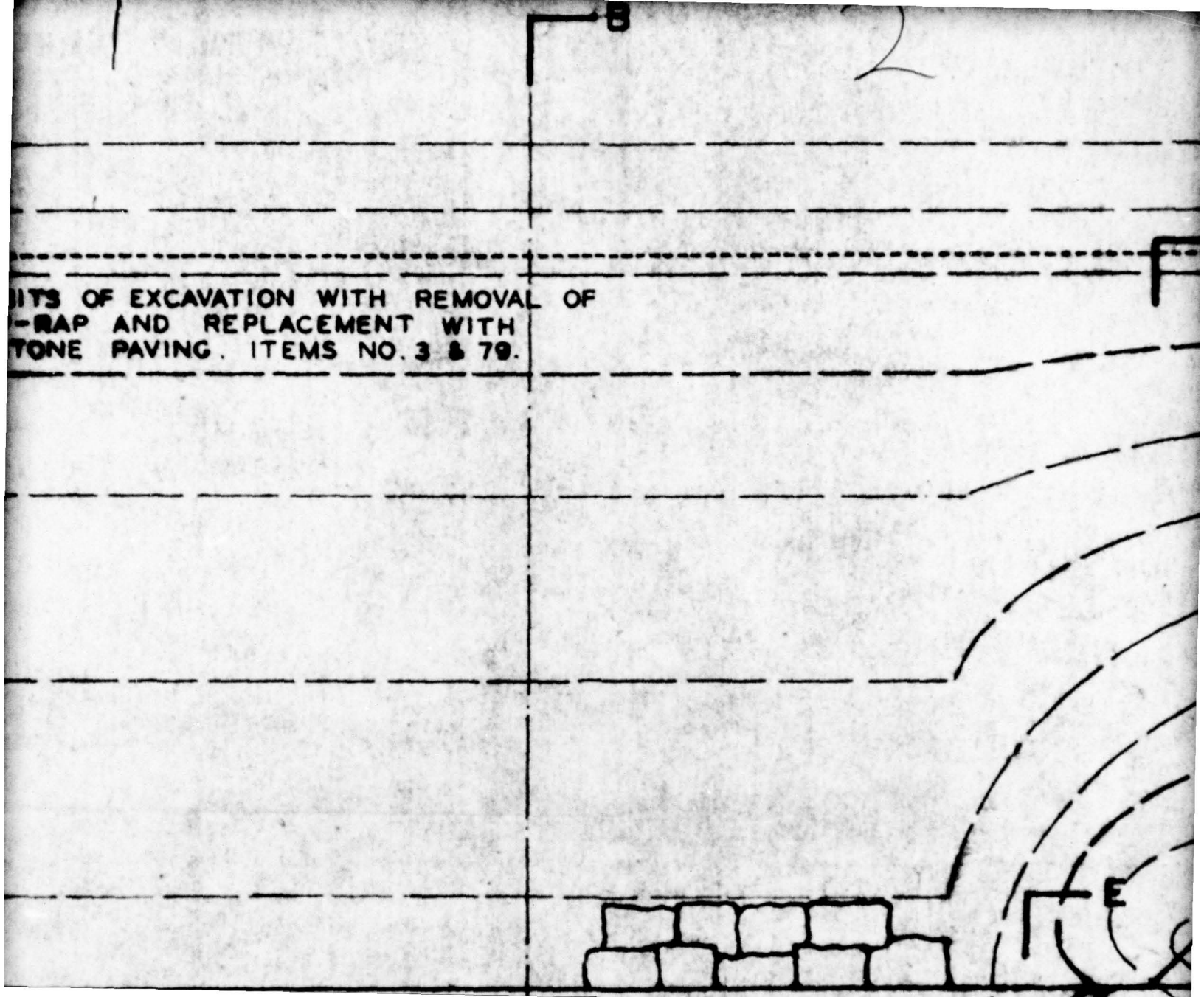
ITS OF EXCAVATION WITH REMOVAL OF
-RAP AND REPLACEMENT WITH
TONE PAVING. ITEMS NO. 3 & 79.
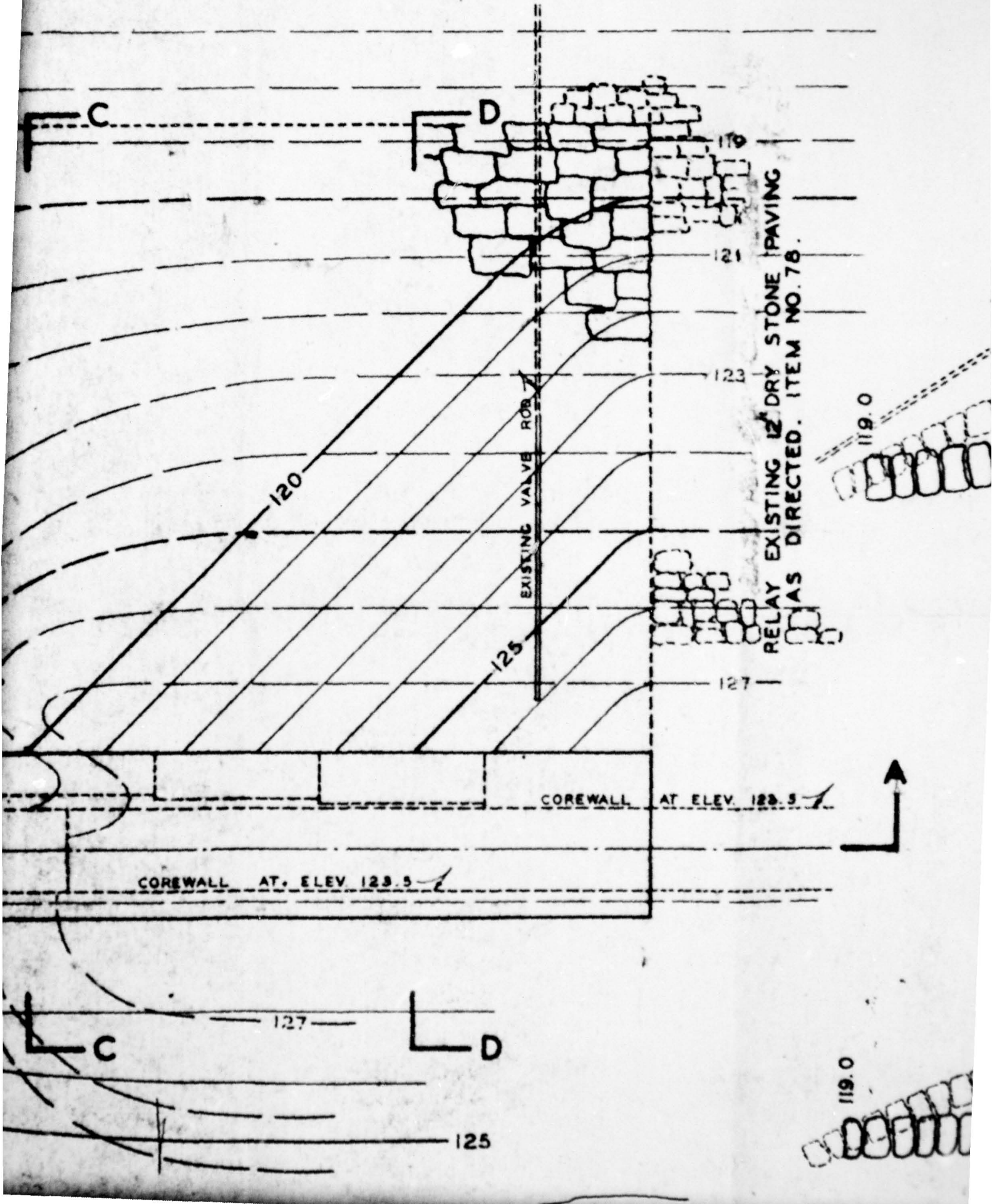
RELAY EXISTING 12" DRY STONE PAVING AS DIRECTED. ITEM NO. 78.

CKISTING VALVE ROD

COREWALL AT ELEV. 123.5

COREWALL AT. ELEV. 123.5

C

D

C

D

119.0

119.0

120

125

119

121

123

127

127

125

1·0 2·8 2·5

3·15 2·2

3·5 2·0

1·1 1·8

1·25 1·4 1·6
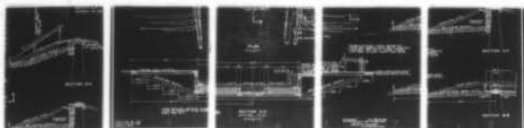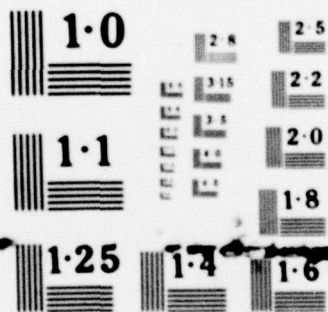
NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

CONSTRUCT NEW RUSTIC
TIMBER SUPPORT
ITEM NO. 90.
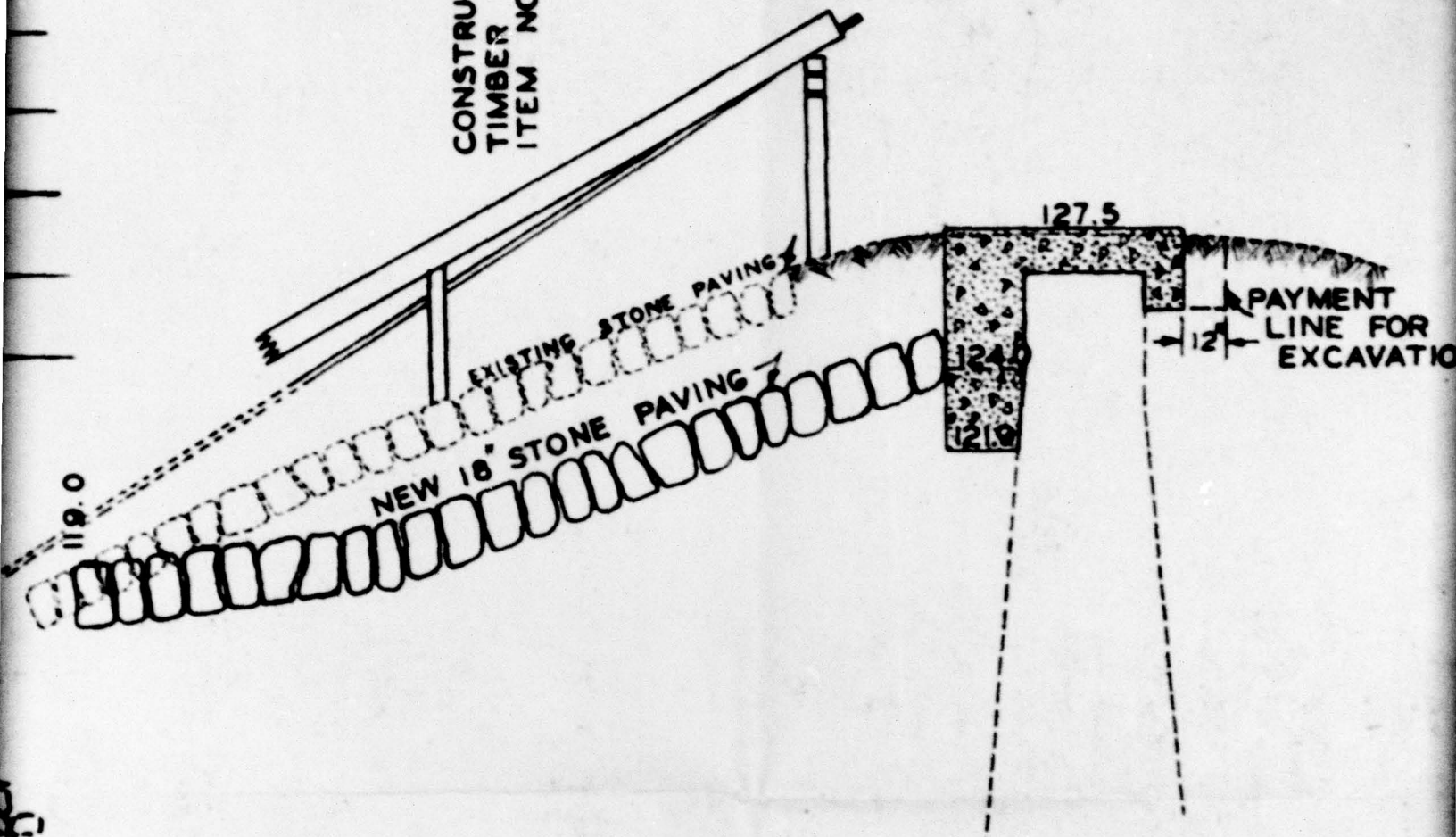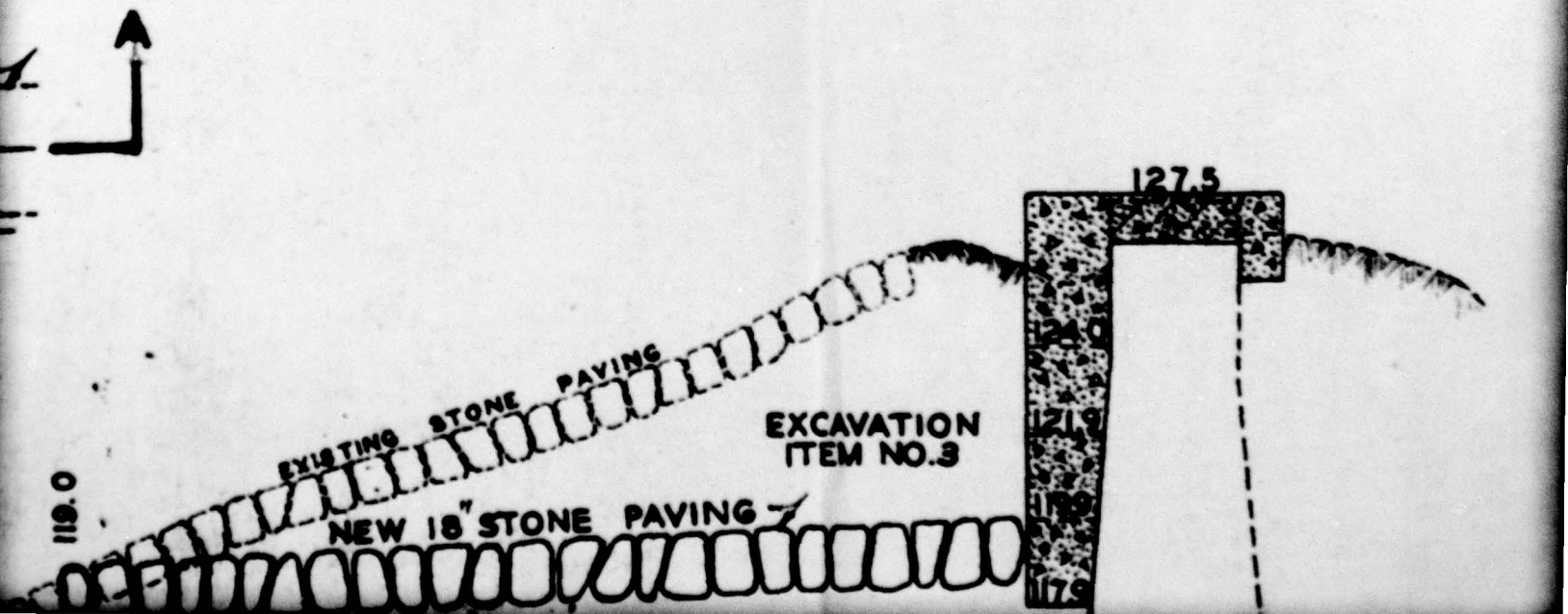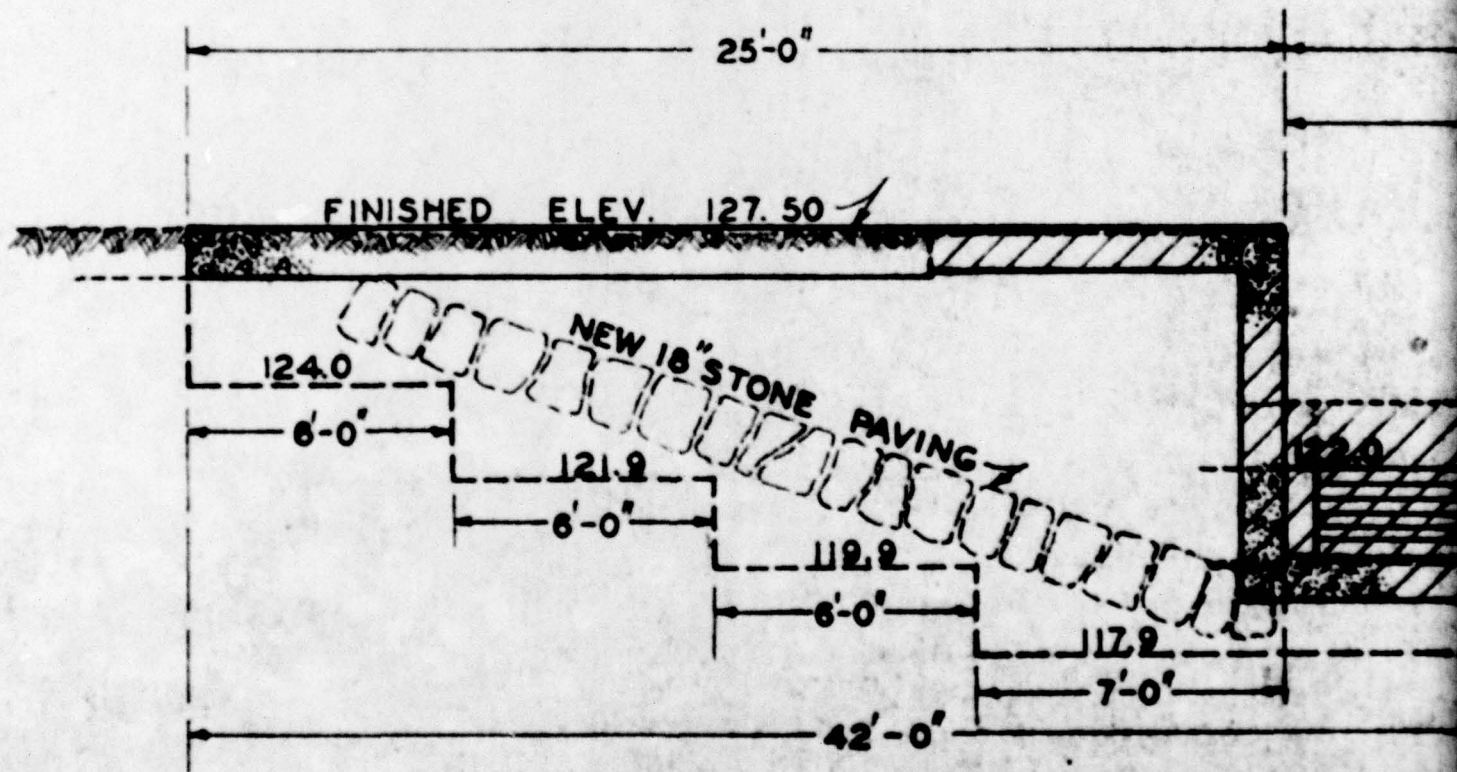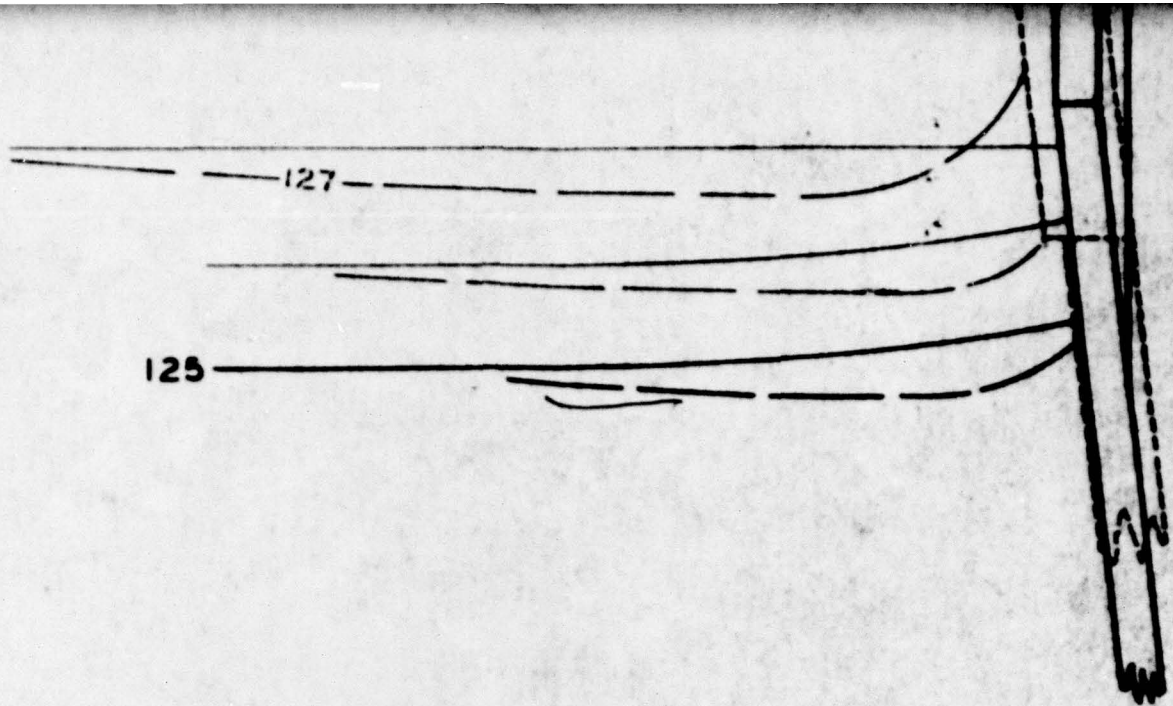
127.5

EXISTING STONE PAVING

PAYMENT
LINE FOR
EXCAVATION

12

NEW 18" STONE PAVING

124.0

121.0

119.0

SECTION D-D

127.5

EXISTING STONE PAVING

124.0

EXCAVATION
ITEM NO.3

121.0

NEW 18" STONE PAVING

119.0

117.0

127

125

25'-0"

FINISHED ELEV. 127.50

NEW 18" STONE PAVING

124.0

6'-0"

121.9

6'-0"

119.9

6'-0"

117.9

7'-0"

42'-0"

5

STOP LOG PIERS

B

EXISTING MASONRY WALL

C

E

NEW SPILLWAY

PLAN
SCALE $\frac{1}{4}$" = 1 FT.

34'-0"

11'-0"   9'-0"   11'-0"

REMOVE EX
CONCRETE
OR TO LIN
AS DIRECT
FINISHED
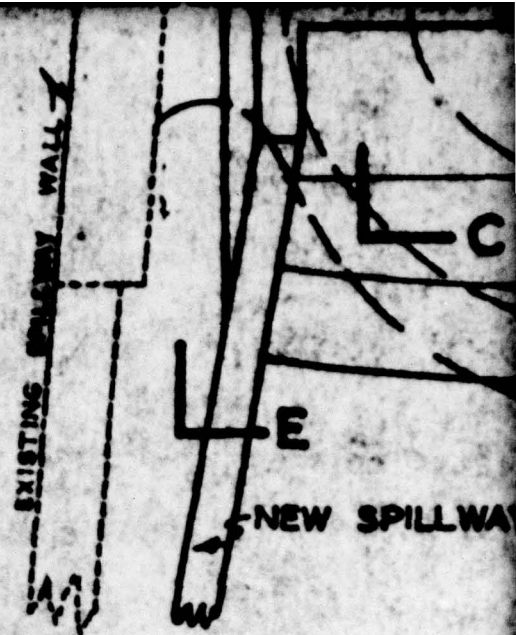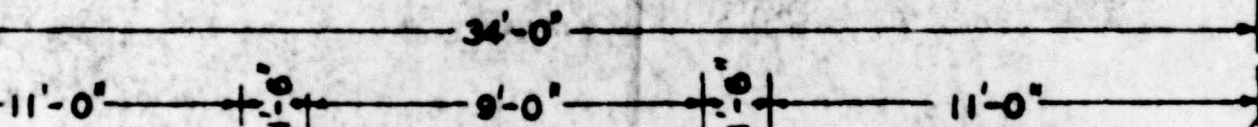
TOP OF EXISTING
PIER ELEV. 127.4

TOP OF   EXISTING SPILLWAY   ELEV. 123.50

122.0

FINISHED ELEV. 120.0

NEW

127

125

D

WALL

119.0

EXISTING STON

NEW 18" S
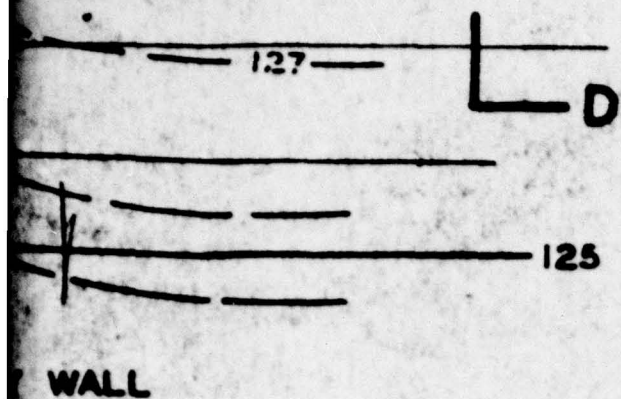
REMOVE EXISTING TIMBERS SUPPORTING
VALVE ROD. SHORTEN VALVE ROD AS DIRECTED.
CONSTRUCT NEW RUSTIC TIMBER SUPPORT.
THIS WORK INCLUDED UNDER ITEM NO. 90.

XISTING PIER TO
OF COREWALL
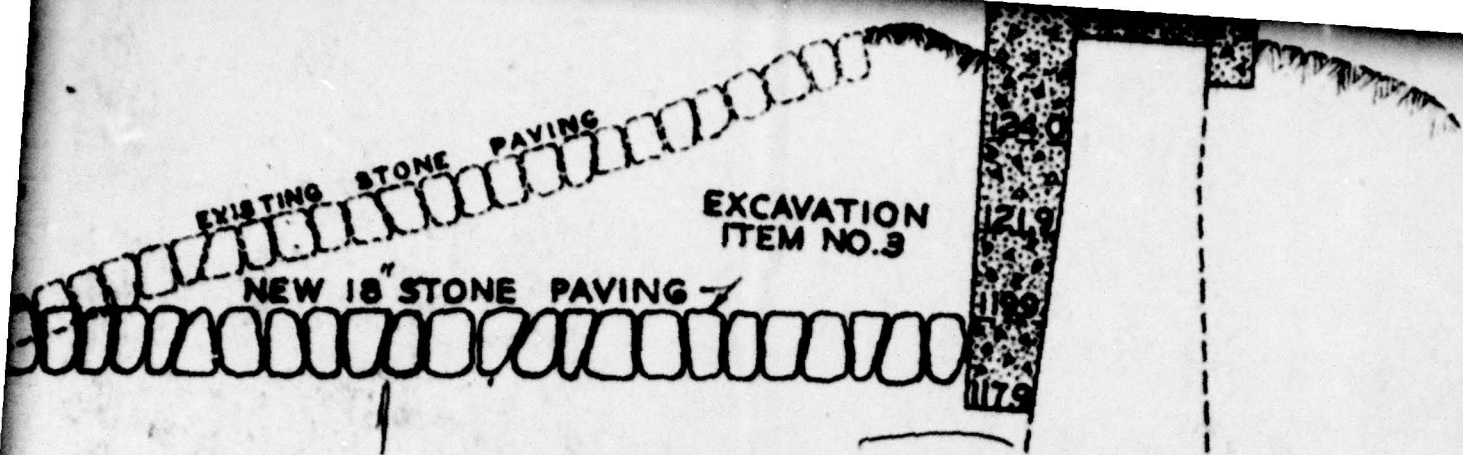ES AS SHOWN OR
ED IN FIELD.
ELEV. 127.50±
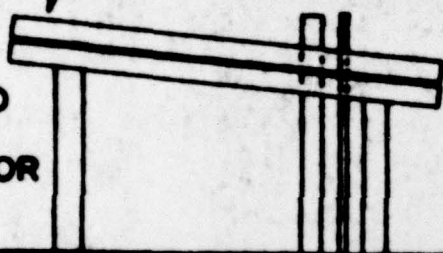
EXISTING GROUND SURFACE 127.9±

TOP OF EXISTING COREWALL ELEV., 126.4±

STONE PAVING

124.0

121.9

119.0

NEW 18" ST

119.2

1   7

EXISTING STONE PAVING

EXCAVATION
ITEM NO.3

NEW 18" STONE PAVING

124.0

121.9

120.0

117.9

SECTION C-C

ITING
DIRECTED.
SUPPORT.
NO.90.

RFACE 127.5±

WALL ELEV. 126.4±

127.5

126.4

EXISTING STONE PAVING

NEW 18" STONE PAVING   4.2 %

119.93

122.0

120.0

118.5

117.93

26'±

SECTION B-B

8